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A REVISION OF THE SPECIES OF AMICROCENTRINAE, A NEW SUBFAMILY (HYMENOPTERA, BRACONIDAE), WITH A DESCRIPTION OF THE FINAL LARVAL INSTAR OF *AMICROCENTRUM CURVINERVIS* BY J. R. T. SHORT

by

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With 68 text-figures

Abstract

A new subfamily is erected for the Afrotropical genus *Amicrocentrum* Schulz, 1911, hitherto included in the Macrocentrinae. A key to the subgenera and species is given for the first time and the species are redescribed. One new species, *Amicrocentrum exilis*, and one new subgenus, *Platyxanion*, are described. The final larval instar of *Amicrocentrum curvinervis* (Cameron) is described.

Introduction

When revising the subfamily Macrocentrinae (the genus *Macrocentrus* s.s. excluded) I had to deal with the aberrant genus *Amicrocentrum* Schulz, 1911. The species are very conspicuous, large, mostly yellow or light brown in colour and have many apomorphous (derived) character-states. Revision was difficult since there was little material in most collections. Detailed study showed that *Amicrocentrum* could not be retained in the Macrocentrinae because of the lack of synapomorphous character-states. The characters of *Amicrocentrum* differ from those of other subfamilies of Braconidae; a new subfamily is therefore erected for the genus. The distribution of *Amicrocentrum* appears to be restricted to the Afrotropical Region. An aberrant species which occurs in Malagasy is placed in a new subgenus.

The small amount of relevant literature is listed in Shenefelt (1969: 141).

Terminology

General terminology is given by Van Achterberg (1976a: 160—166). The name of the postero-basal lobe of the hind wing needs explanation. Hamilton (1971: 429) and Brothers (1975: 520) have pointed out that the use of the name anal or vannal lobe of most authors is incorrect. This lobe is bordered anteriorly by a non-functional fold (the plical furrow or fold, a "paleopterous fluting" according to Hamilton (1971: 432)) and should therefore be called a plical lobe (Brothers, 1975:

520). The main difference between an anal (vannal) fold and a plical fold is in its position. The plical fold is situated in the submediellan cell (M + Cu in fig. 32 of Brothers) and goes through the nervellus. The anal (vannal) fold is situated well below the nervellus and the submediellan cell and functions in the wing-folding process.

PHYLOGENY

The genus *Amicrocentrum* shows the following remarkable apomorphous character-states:

1. The very large plical lobe is perpendicularly setose (fig. 8). The perpendicular setosity of the lobe is unique in Braconidae, and in Hymenoptera as far as I know, and is without doubt an apomorphous character-state. The well developed plical lobe of Symphyta is a plesiomorphous character-state.

2. A medial basal hole is present in the first metasomal tergite. This depression should not be confused with the much shallower depression which is situated more basally where the adductor is attached (fig. 17). This hole is a unique development in Hymenoptera and an apomorphous character-state within the order.

3. Deep depressions are present in the first and second tergites of the metasoma of the males and these are more or less covered by fatty secretions between the pubescence (fig. 15). I am not aware of such structures in other Hymenoptera, apart from the males of *Aleiodes excavatus* (Telenga) (Braconidae, Rogadinae) (Van Achterberg, 1975: 16, fig. 1) and the males of the *striatula*-group of *Parischnogaster* Schulthess (Vespidae, Stenogastrinae) (Van der Vecht, pers. comm.). The functions of these depressions and secretions are uncertain, but the structures are an independently acquired apomorphous character-state in Hymenoptera.

4. The maxillary and labial palpi are strongly reduced and both virtually one-segmented (fig. 23). Reduction of the palpi is quite a common tendency in the Braconidae (Van Achterberg, 1976b: 35), but the condition reached in *Amicrocentrum* is extreme and a strongly apomorphous character-state. In contrast, the palpi of Macrocentrinae are well developed and consist of 5 or 6 and 4 segments, respectively.

5. The prepectal, hypostomal and occipital carinae are absent. The presence of these carinae is generally accepted as a plesiomorphous character-state. These carinae are present in many groups of Hymenoptera which are not closely related and have many other plesiomorphous character-states in common. In the Macrocentrinae the occipital carina is absent but the prepectal and hypostomal carinae are always present.

6. The dorsal carinae of the first tergite are absent (fig. 29). As shown by several groups of Braconidae with other plesiomorphous character-states, the presence of at least short basal dorsal carinae must be considered a plesiomorphous character-state within the Braconidae.

7. The pedicellus is cup-shaped (figs. 28, 33). I have not seen this peculiar shape in other Ichneumonoidea. It seems to have been derived from the common cylindrical shape.

8. The second tergite of the metasoma is less setose than the posterior half of the third tergite. Reduction in setosity is a common feature, but the pattern in *Amicrocentrum* is remarkable and apomorphous.

9. The fore tibial spur is bare, stout, curved, rather wide and flattened (figs. 57—59). In Hymenoptera a slender, more or less cylindrical, rather narrow spur with a narrow flange at the inner side is the common plesiomorphous character-state.

10. The hind tibia and tarsus are long, the length of the hind tibia being 1.9—2.4 times the hind femur (figs. 34, 56). This is a peculiar feature which is exceptional in Hymenoptera. In Braconidae the hind tibia is generally 10—35% longer than the femur.

It is striking that almost no synapomorphous character-states exist between the Macrocentrinae and the genus *Amicrocentrum*. The most important apomorphous character-states of the Macrocentrinae contain that the trochantelli are apically toothed, the claws simple or with a lobe, the occipital carina absent and the n. rec. far antefurcal. The shared character of reduction of the occipital carina is insufficient for retaining *Amicrocentrum* in the Macrocentrinae.

Plesiomorphous character-states of *Amicrocentrum* are:

1. The n. rec. is postfurcal. In Hymenoptera there is a general trend towards reduction of the apical veins with the veins becoming situated more basally. In this perspective a postfurcal n. rec. is a plesiomorphous character-state.

2. The first transverse anal vein is present. This vein is weakly developed, but its presence indicates a more complex and plesiomorphous state of venation.

3. A laterope is present. In the Ichneumonoidea this character is common in groups which show several other plesiomorphous character-states. It is most likely an early development and should be considered a plesiomorphous character-state within the Ichneumonoidea.

4. The claws are bifurcate (fig. 13). As pointed out by Brothers (1975: 521) simple bifurcate claws may be considered a plesiomorphous character-state in Hymenoptera.

5. The costa and subcosta are more or less separated from each other (fig. 8). In parasitic Hymenoptera there is usually no space between these veins or, at most, a small space apically. Because there is a well-developed cell between these veins in Symphyta, the presence of a narrow cell in the Amicrocentrinae is a plesiomorphous character-state within the Braconidae.

6. The mesoscutum is without a lateral carina. A well developed lateral carina of the mesoscutum seems to be a later development in the Braconidae.

7. The plical lobe is very large, as in the Symphyta.

The following are the more doubtful character-states of *Amicrocentrum*:

1. The ovipositor is long. An ovipositor as long as the forewing or somewhat shorter is often associated with other plesiomorphous character-states in the Braconidae. But the very long ovipositor of *Amicrocentrum* and some Macrocentrinae may be a secondary (apomorphous) development. The ovipositor of *A. seyrigi* is intermediate in length.

species	*seyrigi*	*concolor*	*curvinervis*	*exilis*	*flavipenne*	species
plesiomorphous character-state (0)						apomorphous character-state (●)
notauli present	●	○	○	○	○	notauli absent
4th tergite densely setose	●	○	○	○	○	4th tergite felty setose
mediella almost straight	○	●	●	●	●	mediella sinuate
ocelli rather small	○	●	●	●	●	ocelli large
metasoma depressed	○	○	●	●	●	metasoma compressed
clypeus convex	○	○	○	●	●	clypeus flattened
metacarpella complete	○	○	○	○	●	metacarpella reduced

Table 1. Presence or absence of apomorphous character-states in the species of *Amicrocentrum*.

2. The metasoma is inserted above the hind coxae. This is probably a plesiomorphous character-state, apart from the extreme conditions in the Cenocoeliinae and Evanioidea. It occurs in several subfamilies of the Braconidae which are not closely related (e.g., Helconinae, Macrocentrinae, Orgilinae, Agathidinae) as well as in the Ichneumonidae (subfamily Labeninae (= Labiinae sensu Townes)).

3. The radiellan cell of the hind wing is somewhat widened apically. This is probably a plesiomorphous character-state, if shown in a moderate manner as in the Amicrocentrinae.

The Amicrocentrinae are an isolated and specialized group. As shown above, it has little in common with the Macrocentrinae. It may be related to the Helconinae s.l. The genus *Brulleia* Szépligeti, in particular, shares some characters with the Amicrocentrinae, such as the large plical lobe, the dilated radiellan cell, the short second abscissa of the subcostella and the long nervellus. The tribe Trachypetini of the Sigalphinae also shows some resemblance to the Amicrocentrinae, but the nervellus is broken apically, the shape of the first metasomal tergite is quite different, the occipital and prepectal carinae are present and the absence of well-defined synapomorphous character-states indicate that the relationship is superficial. The Amicrocentrinae may be treated provisionally as an early offshoot of the Helconinae s.l. This concurs with the evidence of larval characters (figs. 2—5).

Table 1 gives the occurrence of the plesiomorphous and apomorphous states of some characters within the genus *Amicrocentrum*. These indicate the pattern of evolution within the genus. One of the two species which occur in Malagasy, *A. seyrigi*, is isolated in showing a peculiar combination of apomorphous and plesiomorphous character-states. A new subgenus is therefore erected for this species. Of the remaining four species, *A. flavipenne* is also restricted to Malagasy. This species is closely related to *exilis* and has probably developed from an invasion of an *exilis*-like ancestor. Three species occur only in continental Africa. Of these, *concolor* has the most plesiomorphous character-states and *curvinervis*, which is relatively common, has an intermediate position. *A. exilis* is rather specialized and shares some apomorphous character-states with *flavipenne*, such as the flattened clypeus and the slender first tergite (figs. 49, 68). These characters are absent in other species and indicate the close relationship shown in fig. 1.

BIOLOGY

At least two species of *Amicrocentrum* are larval parasites of large, boring caterpillars of Lepidoptera. *Amicrocentrum exilis* spec. nov. has been reared from *Eulophonotus myrmeleon* Felder (Cossidae, Cossinae). *A. curvinervis* (Cameron) has been reared from the maize stalk borer *Busseola fusca* (Fuller) (Noctuidae) and may therefore be of economic importance. The selection of boring hosts is a further plesiomorphous character-state, since braconids are considered to be derived from ectoparasites of boring coleopterous larvae.

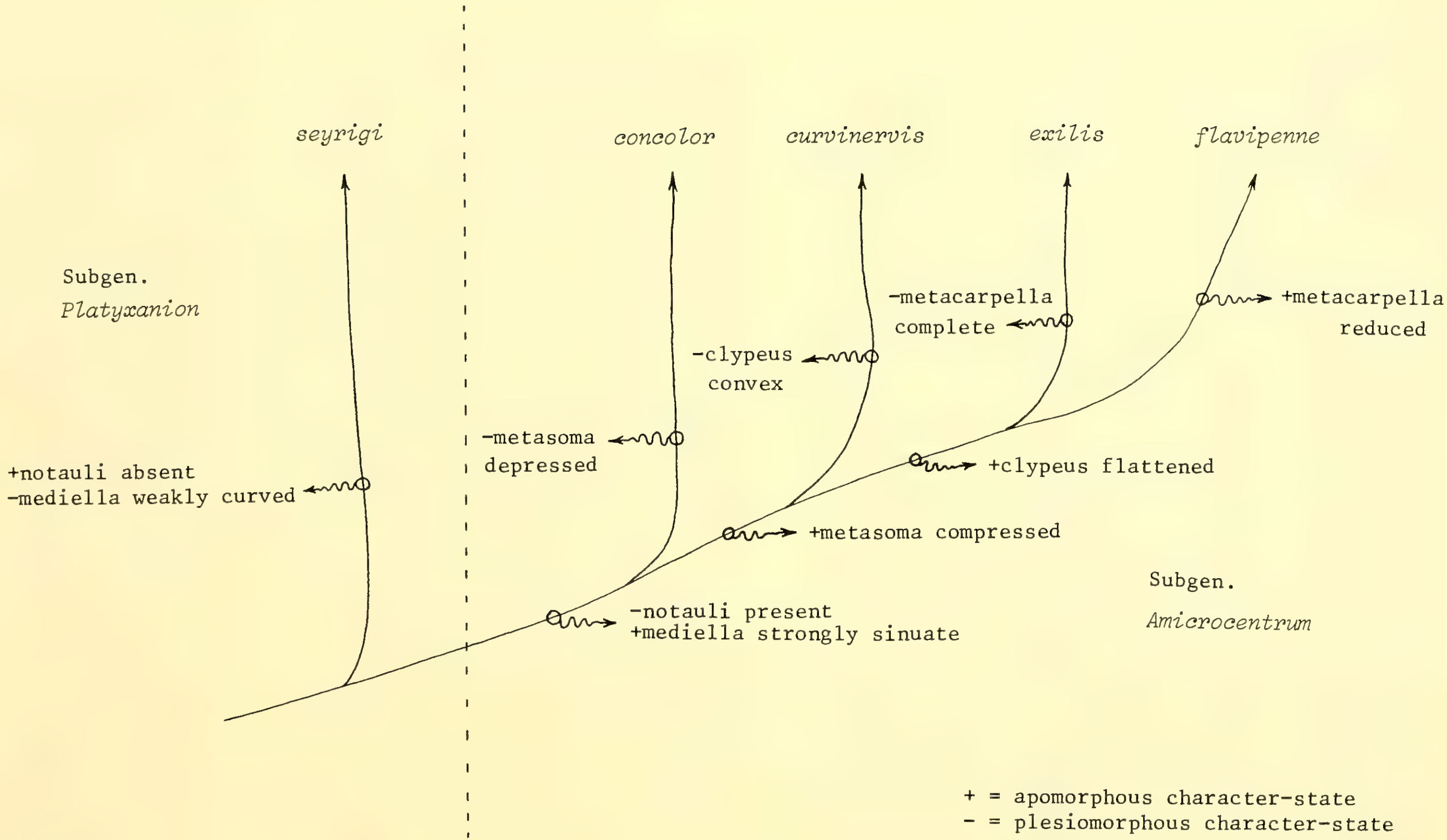


Fig. 1. Dendrogram depicting the relations of the species of *Amicrocentrum* as deducted from the data in table 1.

LARVAL CHARACTERS OF AMICROCENTRUM CURVINERVIS (figs. 2—5)

(By J. R. T. Short, Department of Zoology, Australian National University, Canberra, Australia). [1])

The methods used in making slide preparations from final larval instar exuviae are described in Short (1978: 4). Terminology, and its basis in comparative morphology, is given in Short (1952). Material studied: 1 male final instar larva of *Amicrocentrum curvinervis* (Cameron), "Makarere, x.1969, Uganda, Dennis Owen", "Ex larva *B. fusca*" (TC).

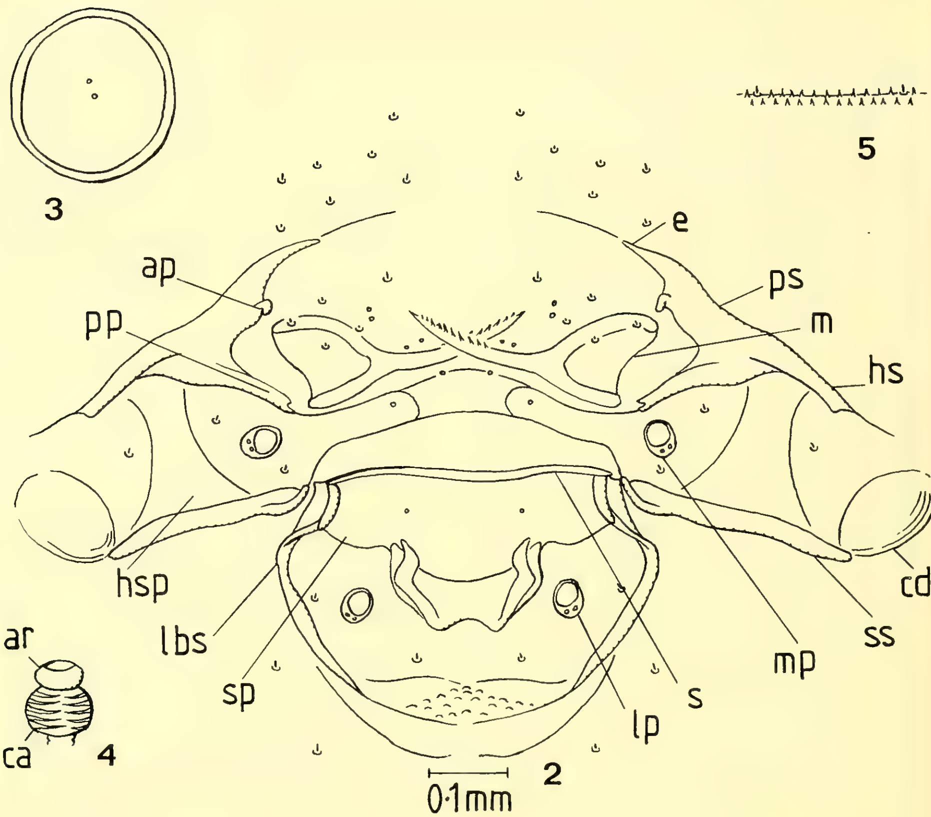
Description. — Of the head sclerites (fig. 2), epistoma (e) with dorsal part unsclerotized; pleurostoma (ps) very broad; anterior pleurostomal process (ap) hook-like; posterior pleurostomal process (pp) in the form of a narrow rod; hypostoma (hs) with median part only sclerotized and not extending laterally (posteriorly) beyond lateral end of stipital sclerite (ss); hypostomal spur (hsp) represented by broad and faintly sclerotized band between hypostoma and stipital sclerite; each stipital sclerite (ss) a slender rod, with median end fitting into socket in antero-lateral end of labial sclerite (lbs); each cardo (cd) represented by lightly sclerotized oval plate; labial sclerite (lbs) with lateral parts slender and sclerotized and ventral part broad and lightly sclerotized; maxillary (mp) and labial palps (lp) disc-shaped and each with one large sensillum and two very small sensilla; salivary orifice (s) prominent; silk press (sp) broad and lightly sclerotized and with two small sensilla on dorsal part; setae and sensilla present on maxillae, labium and clypeo-labrum; prelabial and labral sclerites absent; mandible (m) with triangular base and long, curved, slender blade with length about twice that of base and with prominent teeth on median half of blade. Antenna (fig. 3) disc-shaped with circumference lightly sclerotized and with two sensilla on membrane. Spiracle (fig. 4) relatively very large, with closing apparatus (ca) adjoining atrium (ar) and closing apparatus with prominent sclerotized bands on wall. Skin (fig. 5) with small setae and numerous small spines.

The cocoon of *Amicrocentrum curvinervis* is 20 × 4.5 mm, pale stramineous, moderately thin and somewhat translucent but not porous, and with very little loose silk on the surface. Emergence was by transversely cutting off one end.

Systematic position of *Amicrocentrum*. — *Amicrocentrum* shows characters resembling those of the Macrocentrinae. I know the larval characters only of *Macrocentrus* of the Macrocentrinae. *Amicrocentrum*, like *Macrocentrus* has the lateral parts of the labial sclerite slender and sclerotized and the ventral part broad and lightly sclerotized. In both genera the salivary orifice is prominent and the silk press broad and lightly sclerotized. The stipital sclerite is also similar. However, *Macrocentrus* differs from *Amicrocentrum* in that the lateral part of each hypostoma is well sclerotized and the hypostomal spur is represented by a projection on the hypostoma (Short, 1952: fig. 29). The mandibles of these genera differ in that, although both are slender in form and have the blade toothed, in *Amicrocentrum*

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[1]) This work was supported by the Australian Research Grants Committee.



Figs. 2—5. Final larval instar of *Amicrocentrum curvinervis* (Cameron). 2, anterior view of head with sclerites flattened, ap = anterior pleurostomal process, cd = cardo, e = epistoma, hs = hypostoma, hsp = hypostomal spur, lbs = labial sclerite, lp = labial palp, m = mandible, mp = maxillary palp, pp = posterior pleurostomal process, ps = pleurostoma, s = salivary orifice, s = silk press, ss = stipital sclerite; 3, antenna; 4, spiracle, ar = atrium, ca = closing apparatus; 5, skin. (Drawing by J. R. T. Short).

the blade is much more slender than the base and teeth are present only on the median half of the blade. The disc-shaped antennae differ also in that the circumference is lightly sclerotized in *Amicrocentrum* but not in *Macrocentrus*. The spiracle is relatively very large in *Amicrocentrum* and distinctive in form. In *Macrocentrus*, the closing apparatus of the spiracle is only as wide as the atrium and does not adjoin the atrium. The skin also differs in these genera in that, although there are numerous small spines present on the skin in both, setae are present in *Amicrocentrum* but not in *Macrocentrus*.

Amicrocentrum, although keying out generally near the Macrocentrinae (see Čapek, 1970, 1973) must be considered to stand apart from this subfamily on the differences listed above. It is therefore recommended that, on larval characters, *Amicrocentrum* should be placed in a separate subfamily of the Braconidae.

Amicrocentrum is, as far as known, a solitary endoparasite of lepidopterous larvae. The larval characters indicate that the genus is one of the less specialized of the endoparasitic Braconidae and show a combination of generalized and specialized characters. The hypostoma and hypostomal spur are reduced but the antenna, although disc-shaped, shows a sclerotized circumference. The cardo is present, the mandible is toothed and setae are present on the skin, all of these being primitive characters. It appears that *Amicrocentrum*, like the Macrocentrinae, is an endoparasite showing only some specialized characters.

Amicrocentrinae subfam. nov.

Diagnosis. — Length of body 9.0—27.3, length of fore wing 7.4—20.9 mm; antennal segments of ♀ 46—59, of ♂ 44—53; apex of scapus truncate or nearly so; pedicellus cup-shaped, narrowed basad (fig. 33); maxillary and labial palpi reduced, very short, only visible from ventrad and both virtually one-segmented, but their bases somewhat wider and slightly differentiated (fig. 23); face unevenly convex; anterior tentorial pits large and deep (fig. 16); apical margin of clypeus not differentiated, thick, and weakly concave or almost straight medially (fig. 22); labrum not or narrowly visible; occipital and hypostomal carinae and occipital flange absent; mandible large, with two sharp and stout teeth, the second tooth much shorter than the first tooth (fig. 32); eye bare; pronope absent; propleural lamella more or less developed (fig. 30); pronotum with postero-dorsal corner somewhat protruding as does anterior part of mesopleuron; tegulae not reaching anterior margin of mesopleuron (fig. 30); prepectal carina completely absent (fig. 18); precoxal suture not or shallowly impressed (fig. 42); mesoscutum without a lateral carina in front of tegulae; metapleural flange or lamella absent; dorsal surface of propodeum not differentiated from its posterior surface (fig. 42); propodeum without areola and tubercle; antepropodeal suture narrow and deep; propodeal spiracle large; scutellar suture rather deep, wide and rather short (fig. 66); scutellum without lateral carina; metanotum with large convex tubercle posteriorly (fig. 27); metanotum with long pubescence latero-dorsally (this probably connects the plical lobe of the hind wing with the metanotum); first discoidal cell distinctly petiolate and rather wide anteriorly (fig. 25); cuqu 2 present; r 3 more or less curved towards metacarp (figs. 8, 25); n. rec. postfurcal; B 1 strongly widened apicad; cu 1 more or less weakly sinuate (figs. 8, 37); CU 1 smaller than CU 2; d 2 more or less roundly connected to s 1a (figs. 8, 25); nervulus long and straight; nervellus long, departing submedially from the mediella; B 1 closed apically, s 1b present; fringe of wings short; parastigma large; a narrow intercostal cell is more or less developed (figs. 8, 37); distal part of mediellan cell bare; aqu 1 present as a faintly-brownish, pigmented stripe (fig. 37); aqu 2 and aqu' absent; SM mainly bare except for some setae near the nervulus; CU 1 and base of aqu 1 mainly bare; metacarp ends near apex of the radial cell; plical lobe very large and with rather long and perpendicular arranged setae (fig. 25); radiellan cell widened apicad; basella and second abscissa of subcostella short (fig. 46);

metacarpella rather short and more or less straight (fig. 25); discoidella absent; hind tibia and tarsus comparatively long, length of hind tibia 1.9—2.4 times hind femur; length of femur and tibia of hind leg 5.6—7.7 and 12.0—20.3 times their width, respectively; hind tibial spurs short, straight, and setose; hind basitarsus without ventral row of setae; all tarsal claws bifurcate, setose and without subbasal lobe (fig. 65); fore tibial spur bare, curved, rather wide and flattened (figs. 57—59); hind tibia without apical spines; trochantelli simple, without teeth; metasoma inserted medially between dorsal surface of propodeum and insertion of the hind coxae (figs. 42, 54); length of first metasomal tergite 3.0—6.3 times its apical width; first tergite with a medio-basal hole (figs. 29, 41); large, deep, more or less pubescent depressions in males in the first and second tergites (fig. 15); dorsal carinae of first tergite absent (fig. 17); laterope deep, large, elliptical (fig. 42); dorsope absent; first tergite convex, but medially somewhat flattened; second tergite less setose than posterior third of third tergite; third and following tergites densely setose; second tergite without a sharp lateral crease; second and following epipleura with thyridia (fig. 6); length of ovipositor sheaths 1.10—2.01 times length of fore wing and slender; ovipositor straight or nearly so, with an indistinctly developed notch subapically, this notch being absent in *Amicrocentrum seyrigi*; hypopygium large (fig. 18).

Distribution. — Contains only one genus, *Amicrocentrum* Schulz, with five species. Two species are restricted to Malagasy and three species only occur in continental Africa.

Key to subgenera and species of the genus *Amicrocentrum*

1. Second abscissa of mediella slightly curved (fig. 8); notauli absent (fig. 11); ocelli comparatively small, OOL distinctly longer than diameter of ocellus (fig. 14); 3rd and 4th abscissae of cubitus with only yellowish pigment and not sclerotized (fig. 8); 3rd (at least apically, fig. 15) and following tergites felty setose (fig. 17) *(Platyxanion* subgen. nov.) . . . . *seyrigi* Granger
— Second abscissa of mediella strongly sinuate (fig. 25); notauli narrowly developed (figs. 27, 40); ocelli large, OOL subequal to diameter of ocellus (fig. 20) or shorter (fig. 38); 3rd and 4th abscissae of cubitus at least weakly sclerotized (fig. 25); 3rd and following tergites only densely setose (fig. 41) (subgenus *Amicrocentrum* Schulz) 2
2. Clypeus distinctly convex and densely punctate (figs. 22, 32); pterostigma more stout (figs. 25, 37); postero-dorsal corner of pronotum more or less densely punctate, sometimes rather finely (figs. 18, 30) 3
— Clypeus flattened and punctulate (figs. 47, 62); pterostigma slender (figs. 46, 55); postero-dorsal corner of pronotum almost smooth, punctulate (figs. 42, 54) 4
3. Fourth metasomal tergite mainly dark brown; sides of 2nd tergite diverging apicad; length of 2nd tergite 1.4—1.8 times its maximum width (fig. 29); metasoma of ♀ less compressed apicad; length of ovipositor sheaths 1.24—1.50 times fore wing . . . . *concolor* (Szépligeti)

— Fourth metasomal tergite yellowish; sides of 2nd tergite parallel; length of 2nd tergite 2.0—2.8 times its width (fig. 41), exceptionally 1.8 times; metasoma of ♀ strongly compressed apicad; length of ovipositor sheaths 1.60—2.01 times fore wing, usually 1.8—1.9 times . . . . *curvinervis* (Cameron)

4. Metacarpella well developed basally and connected with the subcostella (fig. 46); pterostigma somewhat more slender (fig. 46); medio-basal hole of 1st tergite rather sharp posteriorly (fig. 49); length of malar space of ♀ 0.3—0.5 times basal width of mandible (fig. 47) . . . . *exilis* spec. nov.

— Metacarpella mainly reduced, not connected with the subcostella (fig. 55); pterostigma somewhat less slender (fig. 55); medio-basal hole of 1st tergite rounded-truncate posteriorly (fig. 64); length of malar space of ♀ ca. 0.6 times basal width of mandible (fig. 62) . . . . *flavipenne* Granger

Amicrocentrum Schulz
Platyxanion subgen. nov. (figs. 6—17)

Etymology: from "platys" (Greek for "broad, wide, flat") and "xanion" (Greek for "comb") because of the rather flat and wide fore tibial spur and comb, which serves as a cleaning-device (figs. 57—59). Gender: neuter.

Type-species: *Amicrocentrum seyrigi* Granger, 1949.

Diagnosis. — Ocelli rather small, OOL distinctly longer than diameter of ocellus (fig. 14); mandible not twisted apically; notauli absent (fig. 11); second abscissa of mediella slightly curved (fig. 8); third and fourth abscissae of radius with only yellowish pigment and not sclerotized; nervulus postfurcal or interstitial (fig. 8); radiella straight basally; nervellus distinctly reclivous (fig. 8); glymma reduced; third (at least apically) and following tergites felty setose (figs. 15, 17).

Distribution. — Malagasy: one species.

Note. Apomorphous character-states of *Platyxanion* are: 1— notauli absent; 2— third (at least partly) and following tergites felty setose; 3— reduction of sclerotization of the radius. The plesiomorphous character-states are: 1— second abscissa of mediella slightly curved; 2— ocelli comparatively small; 3— nervulus postfurcal or interstitial.

Amicrocentrum (Platyxanion) seyrigi Granger (figs. 6—17)

Granger, 1949, Mem. Inst. scient. Madagascar 2A: 374—375, fig. 380.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 141.

Lectotype, ♀, length of body 26.1, of fore wing 20.9 mm.

Head. — Antennal segments 49, length of 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 3.0 and 2.5 times their width, respectively, length of both penultimate segments 1.4 and 1.8 times their width, respectively, and apical segment with short spine (fig. 9); dorsal length of eye 1.1. times temple; temple

rugose, rounded behind, slightly wider than width of head at eyes (fig. 14); POL: ∅ ocellus: OOL = 5 : 7 : 13; frons medially concave and rugose, laterally convex and rugose as vertex; face finely punctate-rugose, depressions from antennal sockets to anterior tentorial pits present (fig. 16); clypeus rather convex, finely and densely punctate; epistomal suture indistinctly developed medially; length of malar space 0.7 times basal width of mandible; malar suture well-developed.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum mainly finely punctate, with some short carinae medially (fig. 6); epicnemial area densely rugose-punctate; precoxal suture densely rugose-punctate, as its surroundings (fig. 6); pleural suture deep and rather narrowly crenulate; episternal scrobe narrowly elliptical; metapleuron coarsely reticulate-punctate, but more rugose ventrally; scutellar suture with ca. 16 short carinae; scutellum convex, finely and densely punctate; side of scutellum carinate; surface of propodeum densely punctate; propodeal spiracle elliptical.

Wings. — Metacarpella complete; r 1 : r 2 : r 3 = 13 : 39 : 115; d 1 : d 2 = 4 : 73; cuqu 1 : r 2 : cuqu 2 = 24 : 39 : 29.

Legs. — Hind coxa densely and coarsely punctate dorsally, rather smooth ventrally; length of hind tibia ca. 2.1 times hind femur (fig. 10); length of femur, tibia and basitarsus of hind leg 5.0, 12.0 and 11.4 times their width, respectively; length of spurs of hind tibia 0.34 and 0.28 times basitarsus, slightly curved (fig. 10).

Metasoma. — Length of first tergite 3.5 times its apical width, its surface somewhat microsculptured medially, but mainly smooth (fig. 17); length of ovipositor sheath 1.10 times fore wing; hypopygium somewhat roundly emargined apically.

Colour. — Light brown; tibiae and tarsi more yellowish brown; wing membrane yellowish.

Lectotype in MNHN: "Madagascar, Ranomafana" "Muséum Paris, X.38. A. Seyrig", "49", "Type". Lectotype herewith selected and labelled accordingly. Paralectotypes: (MNHN) 10 ♂ of which 6 examined, all from Malagasy, Bekily and all collected in January or February. Antennal segments 44 (2), 45 (1) or 46 (1); length of fore wing 16.0—18.5, of body 19—24 mm; 1st and 2nd tergites with the typical depressions (fig. 15). Additional specimens examined, all from MNHN and collected in Malagasy: 1 ♀, Vohémar, heavily damaged, nervulus interstitial; 1 ♀, Fort Dauphin, cuqu 2 absent in right wing but in the left wing nearly complete; 1 ♂, Analandravaka, 25.III.1936, antennal segments 44, malar suture almost absent, length of fore wing 19.5, of body 26 mm.

Note. This is a very distinctive species, which is isolated from other species of *Amicrocentrum*. The species is interesting in its combination of plesiomorphous character-states, such as the slightly curved second abscissa of the mediella, and apomorphous character-states, such as the absence of notauli.

Amicrocentrum Schulz, subgenus (figs. 18—68)

Schulz, 1911, Zool, Annln 4: 88.
Szépligeti, 1904, Genera Insect. 22: 145 (*Megacentrus*; nec Heer, 1852).
Cameron, 1912, Annls Soc. ent. Belg. 56: 370 (*Eiolo*).

Type-species: *Megacentrus concolor* Szépligeti.

Diagnosis. — Ocelli large, OOL subequal to diameter of ocellus (fig. 20) or shorter (fig. 38); mandible weakly twisted apically; notauli narrowly developed (fig. 27); second abscissa of mediella strongly sinuate (fig. 25); 3rd and 4th abscissae of radius at least weakly sclerotized; nervulus narrowly antefurcal (fig. 37); basally radiella weakly curved anterad (fig. 37); nervellus straight or weakly reclivous (figs. 25, 37); glymma rather deep anteriorly; 3rd and following tergites only densely setose, pilose (fig. 49).

Distribution. — Afrotropical: four species, one restricted to Malagasy and three to continental Africa.

Note. Apomorphous character-states of *Amicrocentrum* s.s. are: 1— second abscissa of mediella strongly sinuate; 2— nervulus narrowly antefurcal; 3— ocelli large. Plesiomorphous character-states are: 1— notauli present; 2— 3rd and following tergites only densely setose; 3— radius sclerotized.

Amicrocentrum (Amicrocentrum) concolor (Szépligeti) (figs. 18—29, 57—59)

Szépligeti, 1904, Genera Insect. 22: 146, pl. 3, fig. 19 (in *Megacentrus*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4 (1): 141.

Holotype, ♀, length of body 18.1, of fore wing 16.0 mm.

Head. — Antennal segments 48, length of 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 3.6 and 3.1 times their width, respectively, length of both penultimate segments 1.8 and 1.6 times their width, respectively, and apical segment without an apical spine (fig. 26); dorsal length of eye 2.4 times temple; temple mainly smooth, somewhat punctate ventrally and subparallel behind eyes (fig. 20); POL : ∅ ocellus : OOL = 14 : 8 : 7; frons concave and coarsely rugose; vertex punctate; face medially smooth, laterally coarsely reticulate-punctate, with deep grooves from anterior tentorial pits to both sides of the antennal sockets (fig. 22); clypeus rather convex, punctate; epistomal suture obliterated medially; length of malar space 0.2 times basal width of mandible; malar suture narrow, indistinctly developed.

Mesosoma. — Length of mesosoma 1.4 times its height; ventral half of side of pronotum smooth, posteriorly partly coarsely rugose, remaining area remotely punctate and with a deep short crenulate suture (fig. 18); epicnemial area rugose-punctate; mesopleuron dorsally finely and densely punctate but mainly smooth near the pleural suture and ventrally more coarsely punctate; precoxal suture coarsely reticulate-punctate; pleural suture narrowly and densely crenulate, rather deep; episternal scrobe absent; metapleuron rather coarsely punctate and

ventrally rugose; scutellar suture with ca. 20 short carinae; scutellum convex, punctulate, but medially mainly smooth; side of scutellum punctate-rugose; surface of propodeum densely punctate-rugose, posteriorly more coarsely sculptured and with a rather long medial carina; propodeal spiracle subelliptical.

Wings. — Metacarpella complete; r 1 : r 2 : r 3 = 10 : 38 : 91; d 1 : d 2 = -2 : 51; cuqu 1 : r 2 : cuqu 2 = 16 : 38 : 21.

Legs. — Hind coxa densely punctate dorsally; hind tibia missing, but its length ca. 1.9—2.0 times hind femur in other specimens; length of femur, tibia and basitarsus of middle leg 6.3, 9.6, and 14.0 times their width, respectively, these measurements of the hind leg in the ♀ from Urundi are 5.7, 13.0 and 8.6 times, respectively; length of middle tibial spurs both 0.2 times their basitarsus, straight.

Metasoma. — Length of 1st tergite 3.3 times its apical width, its surface punctate-rugose, but apically smooth (fig. 29); length of 2nd tergite 1.4 times its maximum width; length of ovipositor sheath 1.24 times fore wing; hypopygium somewhat concave medio-apically.

Colour. — Light brown (but other specimens usually more yellowish); apices of mandibles and stemmaticum, blackish; pterostigma brownish yellow; wing membrane brownish; 4th segment somewhat darker brown.

Holotype in TMA: "Africa or., Kilima-Ndjaro" "Kilimandscharo" (old hand written label), "Holotype *Megacentrus concolor* Szépl., 1904, det. Papp '67", "Hym. Typ. No. 781, Mus. Budapest".

Additional specimens examined: 18 ♀, 5 ♂ and 1 specimen without metasoma. From Benin (Djougou Kouandé), Burundi (Usumbula), East Africa (Jombene Range, I could not trace this locality), Zaïre (Kivu: Kavimoira (Uvira), at light; Kasenyi), Kenya (Tsavo N.P. (E.): Lion Hill near Voi (500—600 m, deciduous orthophyll savanna, at light); Una (Nziu); Naivasha; Kenani (Mtito Andei) Samburu Game Reserve (Public Camp Site 1, at light); Galana R. (2 ml E. of Tsavo N.P.); Nakuru), Uganda (Karamoja); Ethiopia (Hawash, ca. 3500 ft.); Namibia (Hohnung); S. Africa (Shilouvana (N. Transvaal)) (MNHN, TC, USNM, MAC, BM, LH, RMNH, NMK). Variation: Length of fore wing 7.8—17.0 mm, length of 2nd tergite 1.4—1.8 times its width, antennal segments 46—52, length of ovipositor sheath 1.28—1.50 times fore wing, length of 1st tergite 2.4—3.5 times its apical width, 4th tergite mainly dark brown, contrasting with other, yellowish tergites. Collected in April (10), December (3) and July (2).

Amicrocentrum (Amicrocentrum) curvinervis (Cameron) (figs. 30—41)

Cameron, 1912, Annls Soc. ent. Belg. 56: 372 (in *Eiolo*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4 (1): 141.

Holotype, ♀, length of body 18.5, of fore wing 12.3 mm.

Head. — Antennal segments 25, but apical part absent, length of 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.6 and 3.2 times their width, respectively; dorsal length of eye 2.9 times temple; temple punctate, except near

eyes, rounded behind and sides almost subparallel (fig. 38); POL : ∅ ocellus : OOL = 11 : 11 : 6; frons medially concave, with some rugae; vertex finely and densely punctate; face coarsely and densely punctate, depressions at the inner side of the antennal sockets only (fig. 32); clypeus convex, densely punctate; epistomal suture complete; length of malar space 0.4 times basal width of mandible; malar suture narrowly developed.

Mesosoma. — Length of mesosoma 1.4 times its height; medio-anterior side of pronotum with a deep crenulate furrow, medially and apically rugose-punctate, dorso-apically densely and rather coarsely punctate, ventral half of pronotum smooth but punctulate anteriorly (fig. 30); epicnemial area punctate; precoxal suture coarsely and densely punctate, rest of mesopleuron more remotely punctate; pleural suture narrowly and indistinctly crenulate; episternal scrobe absent; metapleuron densely punctate; scutellar suture with 20, mainly rather short, carinae; scutellum rather convex, punctate laterally, almost smooth medially; side of scutellum punctate-rugose; surface of propodeum coarsely and densely punctate; propodeal spiracle subelliptical.

Wings. — Metacarpella complete; r 1 : r 2 : r 3 = 7 : 32 : 71; d 1 : d 2 = - 2 : 85; cuqu 1 : r 2 : cuqu 2 = 12 : 32 : 16.

Legs. — Hind coxa punctate dorsally; length of hind tibia ca. 2.2—2.3 times hind femur (fig. 34); length of femur, tibia and basitarsus of hind leg 6.0, 18.2 and 19.0 times their width, respectively; length of spurs of hind tibia 0.3 and 0.2 times hind basitarsus, straight.

Metasoma. — Length of 1st tergite 4.0 times its apical width, its surface densely and finely punctate, but apical and basal fifths mainly smooth; length of 2nd tergite 2.3 times its maximum width (fig. 41), sides of the tergite parallel; length of ovipositor sheath 1.77 times fore wing; hypopygium truncate apically.

Colour. — Brownish yellow; stemmaticum and tips of mandibles, dark brown; wing membrane brownish.

Holotype in MAC: "Type", Musée du Congo Belge, Kasai: Eiolo, 16—1—06, Waelbroeck", "R.Dét., E., 189", "*Eiolo curvinervis* Cam., Type" (in Cameron's handwriting), "*Amicrocentrum concolor* (Szpl.) (= *Eiolo curvinervis* Cam.), H. De Saeger, det. 1942".

Additional specimens examined: 31 ♀ and 2 ♂. From Zaïre (1 ♀ without precise locality, "*Megacentrus concolor* Szepl., det. Enderlein, 1918"; Magalo (Ubangi); Lisala Ter.; Libenge; Jaradje (Ituri, Kasima); Tuku (Haut Uelé); Moto (id.); Yebo Moto (id.); Paulis (id.); Watsa (id.); Congo da Lemba; Bambesa; Bombona (Ubangi); Gemena (id.); Bakere (id.); Kunzolo); Benin (?city); Uganda (Bwamba; Zika Forest (= near Entebbe, "ex larva *B. fusca*") (MAC, PAN, TC, LH, NMK, RMNH). The variation is considerable: length of fore wing 10.0—18.0 mm, length of ovipositor sheath 1.60—2.01 times fore wing, antennal segments 51—59, length of 1st tergite 3.1—4.4 times its apical width (exceptionally in males 2.8 times), length of 2nd tergite 2.0—2.5 times its maximum width (in males up to 2.8 times), sides of 2nd tergite parallel, 4th tergite yellowish, not contrasting with other tergites. This species, like *exilis*, seems to be more restricted to the tropical forest, while *concolor* may be restricted to more savanna-like habitats.

Amicrocentrum (Amicrocentrum) exilis spec. nov. (figs. 42—53)

Holotype, ♀, length of body 20.9, of fore wing 19.4 mm.

Head. — Antennal segments 53, 3rd segment equal to 4th segment, 3rd and 4th segments both 4.0 times their width, both penultimate segments 2.5 and 3.0 times their width, respectively, apical segment sharp apically, but spine not well developed (fig. 51); dorsal length of eye 2.3 times temple; temple almost smooth, indistinctly punctulate and rounded behind (fig. 50); POL : ∅ ocellus : OOL = 8 : 13 : 7; medially frons concave, smooth except for a few short carinae; vertex indistinctly punctulate; face below antennal sockets punctate-rugose, rest of face remotely punctate, unevenly convex dorsally, flattened ventrally; clypeus flattened, remotely punctulate; epistomal suture obliterated dorsally; length of malar space 0.5 times basal width of mandible; malar suture indistinctly developed.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum almost smooth, except for some crenulae medio-posteriorly and some punctulation near the margins (fig. 42); epicnemial area finely striate-rugose anteriorly, remotely punctate dorsally as surroundings of precoxal suture; precoxal suture densely and finely rugose-punctate; pleural suture narrow, rather shallow and indistinctly crenulate; episternal scrobe absent, except for an indistinct longitudinal impression; metapleuron remotely punctate; scutellar suture with 9 short carinae; scutellum convex, remotely punctulate; side of scutellum punctulate and with some carinae; surface of propodeum densely and rather finely reticulate-rugose, medially longitudinally depressed; propodeal spiracle elliptical.

Wings. — Metacarpella complete; r 1 : r 2 : r 3 = 12 : 46 : 137; d 1 : d 2 = - 3 : 100; cuqu 1 : r 2 : cuqu 2 = 17 : 46 : 23.

Legs. — Hind coxa finely and remotely punctate; length of hind tibia ca. 2.4 times hind femur (fig. 44); length of femur, tibia and basitarsus of hind leg 7.8, 18.2 and 15.8 times their width, respectively; length of hind tibial spurs 0.25 and 0.20 times hind basitarsus, slightly curved apically, but almost straight.

Metasoma. — Length of 1st tergite 4.4 times its apical width, its surface smooth, except for some microsculpture laterally, only medially sparsely setose, and medio-basal hole rather sharp apically (fig. 49); length of 2nd tergite 3.0 times its maximum width; length of ovipositor sheath ca. 1.47 times fore wing; hypopygium truncate apically.

Colour. — Brownish yellow; stemmaticum, tips of mandibles, flagellum (but apically more yellowish), wing venation (but its basal half yellowish), dark brown; pterostigma and ovipositor sheath brown; wing membrane rather hyaline.

Holotype in TC: "Zika Forest (= near Entebbe), Uganda, viii.23,'63, G. Lancaster". Paratypes: (9 ♀ and 4 ♂): 1 ♀, topotypic, ix—x.1963 (RMNH); 2 ♀ and 3 ♂, Zaïre, Eala, xi.1935, J. Ghesquière (MAC, RMNH); 1 ♀, Zaïre, Kunungu, 1938 (Nkele, coll. Schouteden) (MAC); 1 ♀, Zaïre, Riv. Busira, vi.1936, J. Ghesquière (MAC); 1 ♀, Sankuru: Katako-Kombe, 14.viii.1952, M. Fontaine (MAC); 1 ♀, Zaïre, N. Lac Kivu: Reankwi, 19.ix.1947, J. v. Leroy (RMNH); 1 ♀, Oyoko-Cacas Stn, Oyoka-Ghana, 24.ii-1959, parasite: *Eulophonotus myrmeleon*

(BM); 1 ♀, Uganda, 7 mls from Entebbe, Zika Forest, iii—vi.1961, P. S. Corbet (BM); 1 ♂, Tanzania, Ukerewe I., Father Conrad (NMK).

Variation: Antennal segments 55 (3); length of fore wing 14.0—21.0 mm; length of ovipositor sheath 1.31—1.37 times fore wing; length of 1st tergite 4.4—5.1 times its apical width, but in one male 3.2 times; length of 2nd tergite to 3.2 times its maximum width; length of malar space 0.3—0.5 times basal width of mandible.

Amicrocentrum (Amicrocentrum) flavipenne Granger (figs. 54—56, 60—68)

Granger, 1949, Mem. Inst. scient. Madagascar 2A: 373—374.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4 (1): 141.

Lectotype, ♀, length of body 27.3, of fore wing 20.9 mm.

Head. — Antennal segments 51, length of 3rd segment 1.4 times 4th segment, length of 3rd and 4th segments 4.4 and 4.2 times their width, respectively, both penultimate segments 2.4 and 2.8 times their width, respectively, apical segment without spine (fig. 67); dorsal length of eye 1.8 times temple; temple punctate, rounded behind (fig. 64); POL : ∅ ocellus : OOL = 5 : 8 : 6; frons concave, almost smooth; vertex remotely punctate; face rather flat, finely punctate, but below antennal sockets aciculate-punctulate; clypeus flattened, shiny, punctulate; epistomal suture absent dorsally; length of malar space 0.6 times basal width of mandible; malar suture absent.

Mesosoma. — Length of mesosoma 1.5 times its height; side of pronotum mainly sparsely punctulate, shiny, almost smooth, but with some carinae medio-anteriorly (fig. 54); epicnemial area almost smooth, but somewhat rugose anteriorly; precoxal suture mainly finely punctate as its surroundings, but near middle somewhat rugose (fig. 54); pleural suture narrowly crenulate; episternal scrobe almost absent; metapleuron finely and remotely punctate; scutellar suture with 9 short carinae; scutellum rather convex, remotely and finely punctate; side of scutellum punctate-rugose; surface of propodeum densely rugose-punctate, without a medial carina; propodeal spiracle circular, protruding.

Wings. — Metacarpella of hind wing scarcely developed, reduced and disconnected from the 2nd abscissa of the subcostella (fig. 55); r 1 : r 2 : r 3 = 7 : 33 : 79; d 1 : d 2 = - 2 : 69; cuqu 1 : r 2 : cuqu 2 = 10 : 33 : 11.

Legs. — Hind coxa almost smooth; length of hind tibia ca. 2.4 times hind femur (fig. 56); length of femur, tibia and basitarsus of hind leg 7.7, 20.3 and 17.5 times their width, respectively; length of spurs of hind tibia both 0.2 times their basitarsus, subequal, straight.

Metasoma. — Length of 1st tergite 6.3 times its apical width, its surface smooth but basally somewhat finely coriaceous, its medio-basal hole round apically (fig. 68); length of 2nd tergite ca. 2.9 times its maximum width; length of ovipositor sheath ca. 1.34 times fore wing; hypopygium truncate apically.

Colour. — Brownish-yellow; tips of mandibles and stemmaticum blackish; flagellum dark brown; wing membrane somewhat yellowish.

Lectotype in MNHN: "Madagascar, Rogez, Forêt cote est", "Muséum Paris,

iii.37, A. Seyrig", "53", "Type". Herewith selected as lectotype. Paralectotype: 1 ♂ (MNHN), topotypic, ii.37. Length of fore wing 20.4, of body 26.0 mm; length of 1st tergite 3.7 times its apical width.

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I am much indebted to the following persons for the loan of types and/or gifts of unidentified specimens. The abbreviations used for the collections are given in brackets. Dr. J. Decelle, Musée Royal de l'Afrique Central, Tervuren (MAC); Mr. T. Huddleston, British Museum (Natural History), London (BM); Mr. K. Kabuthia, National Museums of Kenya, Nairobi (NMK); Dr. S. Kelner-Pillault & Mr. B. Sigwalt, Muséum National d'Histoire Naturelle, Paris (MNHN); Dr. E. Kierych, Instytut Zoologii, Warsaw (PAN); Dr. P. Marsh, USDA c/o U.S. National Museum, Washington (USNM); Dr. J. Papp, Zoological Department of the Hungarian Natural History Museum, Budapest (TMA); Dr. H. K. Townes, American Entomological Institute, Ann Arbor (TC); Drs. K. W. R. Zwart, Laboratorium voor Entomologie, Landbouwhogeschool, Wageningen (LH); (RMNH) = Rijksmuseum van Natuurlijke Historie, Leiden.

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LITERATURE

Achterberg, C. van, 1975. Een merkwaardige vondst in Voorne's duinen (Hym., Braconidae). — Ent. Ber., Amst. 35: 15—16, figs. 1—5.

———, 1976a. A revision of the tribus Blacini (Hym., Braconidae, Helconinae). — Tijdschr. Ent. 118 (7): 159—322, figs. 1—476, 2 tables.

———, 1976b. A preliminary key to the subfamilies of the Braconidae (Hym.). — Tijdschr. Ent. 119 (3): 33—78, figs. 1—123, 1 table.

Brothers, D. J., 1975. Phylogeny and classification of the aculeate Hymenoptera, with special reference to Mutillidae. — Univ. Kansas Sci. Bull. 50 (11): 483—648, figs. 1—101, tables 1—7.

Cameron, P., 1912. On the Hymenoptera from Belgian Congo in the Congo Museum, Tervueren. — Annls Soc. ent. Belg. 56: 357—401.

Čapek, M., 1970. A new classification of the Braconidae (Hym.) based on the cephalic structures of the final instar larva and biological evidence. — Can. Ent. 102 (7): 846—875, figs. 1—58.

———, 1973. Key to the final instar larvae of the Braconidae (Hym.). — Acta Inst. forest. Zvol. 259—268, 1 fig.

Granger, C., 1949. Braconides de Madagascar. — Mem. Inst. scient. Madagascar, Sér. A: 1—428, figs. 1—426.

Hamilton, K. G. A., 1971. The insect wing, part 1. Origin and development of wings from notal lobes. — J. Kansas ent. Soc. 44 (4): 421—433, figs. 1—18.

Schulz, W. A., 1911. Zwei hundert alte Hymenopteren. — Zool. Annln 4: 1—220.

Shenefelt, R. D., 1969. Hymenopterorum Catalogus (nov. ed.). Part 4. Braconidae 1: 1—176. — Junk, 's-Gravenhage.

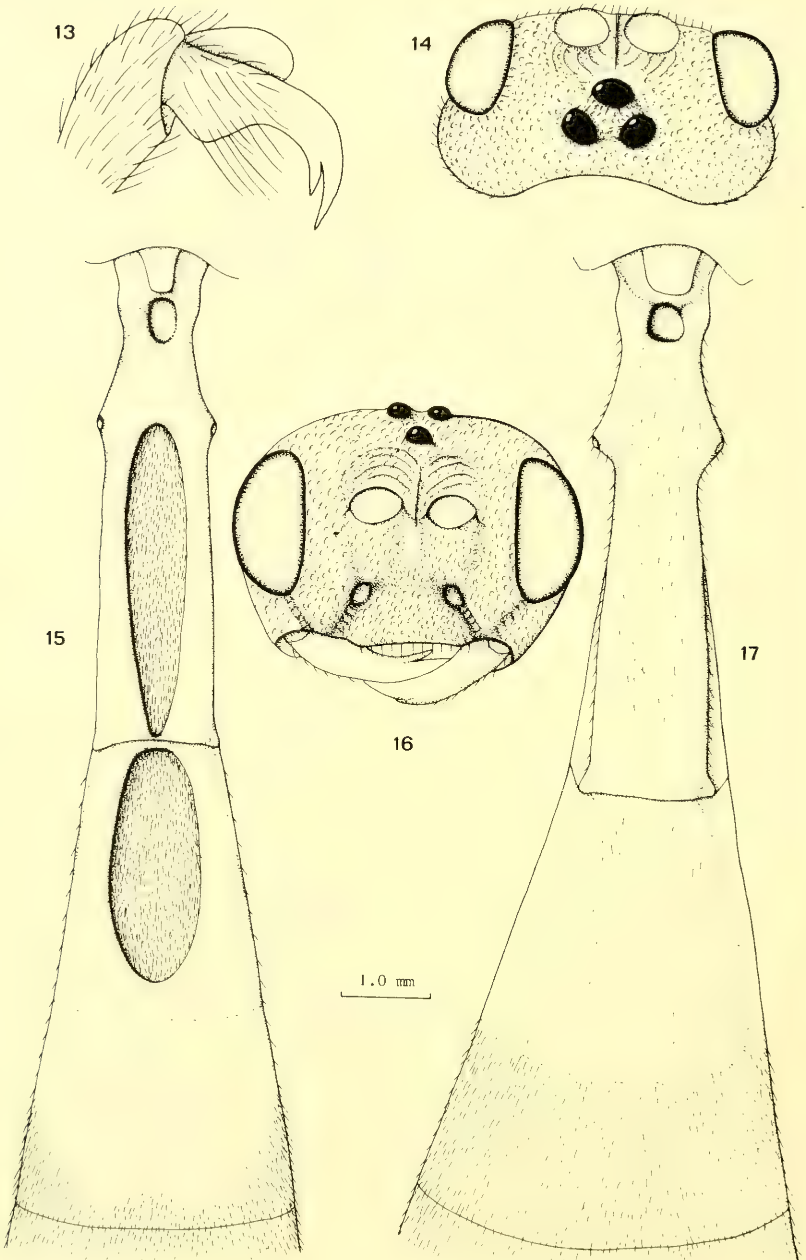
Short, J. R. T., 1952. The morphology of the head of the larval Hymenoptera with special reference to the head of the Ichneumonoidea, including a classification of the final instar larvae of the Braconidae. — Trans. R. ent. Soc. Lond. 103: 27—84, figs. 1—34.

———, 1978. The final larval instars of the Ichneumonidae. — Mem. Am. ent. Inst. 25: 1—514, figs. 1—802.

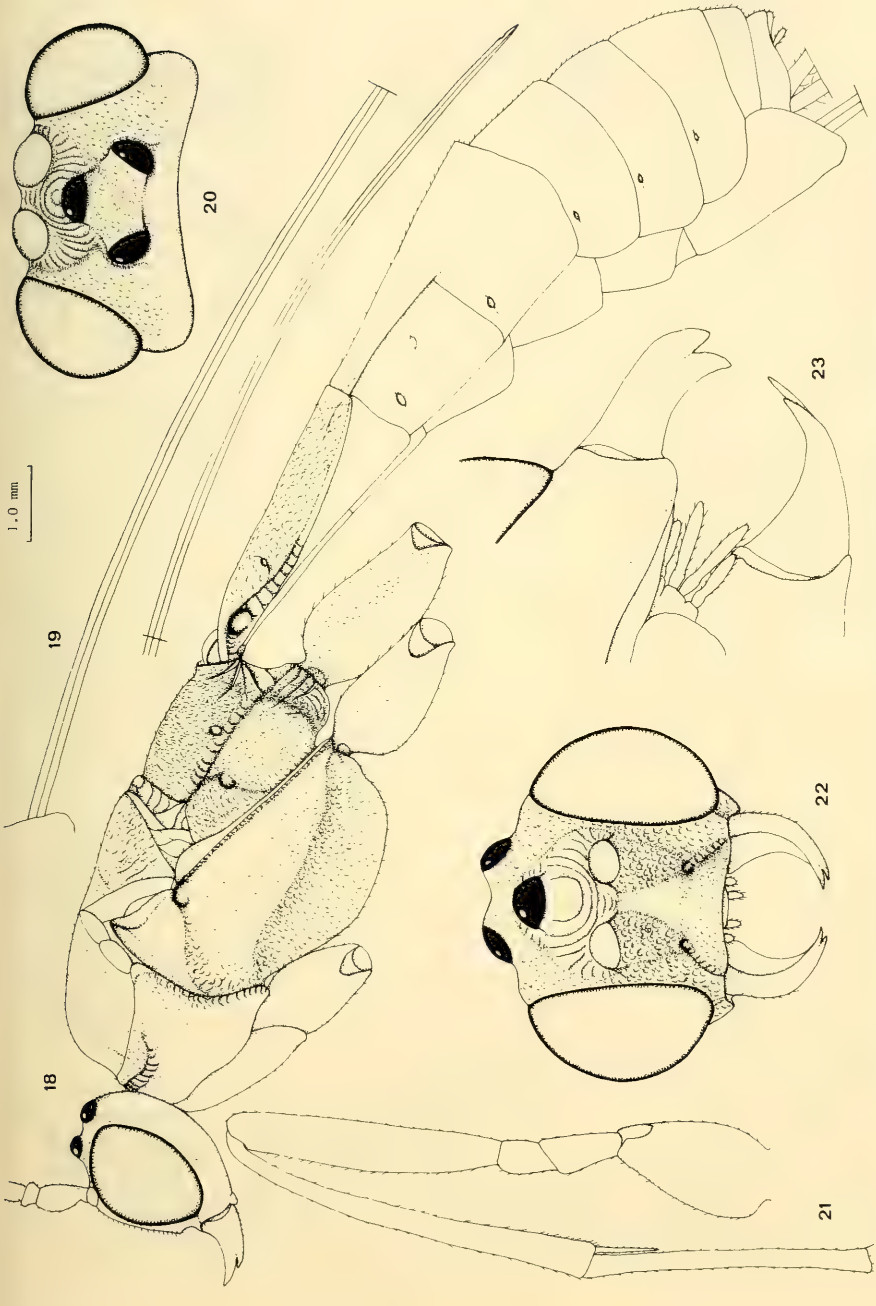
Szépligeti, G. V., 1904. Hymenoptera, Fam. Braconidae. — Genera Insect. 22: 1—253, figs. 1—32.



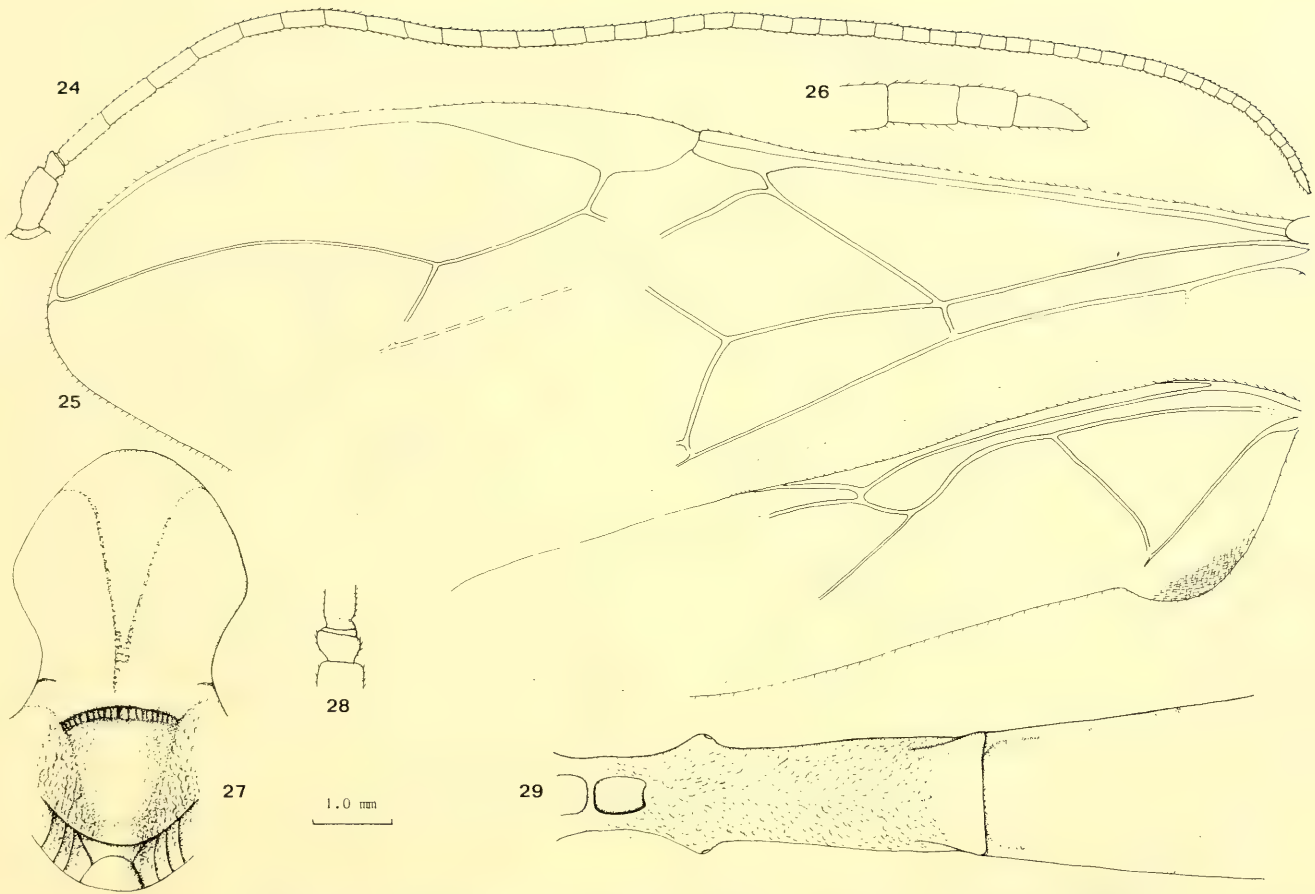
Figs. 6—12. *Amicrocentrum seyrigi* Granger, lectotype. 6, habitus, lateral aspect; 7, ovipositor; 8, wings; 9, apex of antenna; 10, hind leg; 11, mesonotum, dorsal aspect; 12, antenna. 6—8, 10—12: scale-line; 9: 5.0 × scale-line



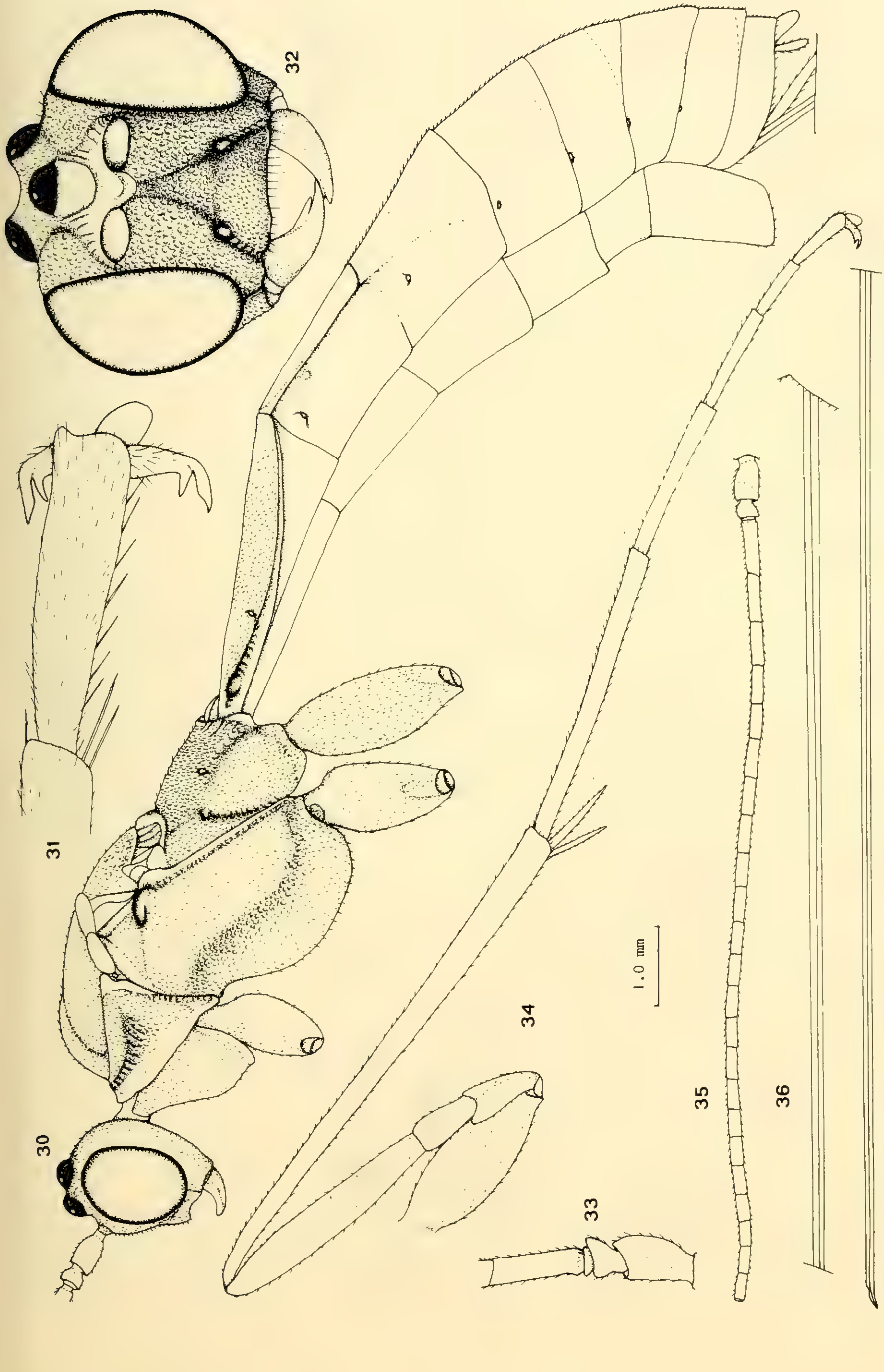
Figs. 13—17. *Amicrocentrum seyrigi* Granger, lectotype (but 15 of paralectotype). 13, outer middle claw; 14, head, dorsal aspect; 15, 1st-3rd tergites, dorsal aspect; 16, head, frontal aspect; 17, 1st-3rd tergites, dorsal aspect. 13: 5.0 × scale-line; 14—17: scale-line



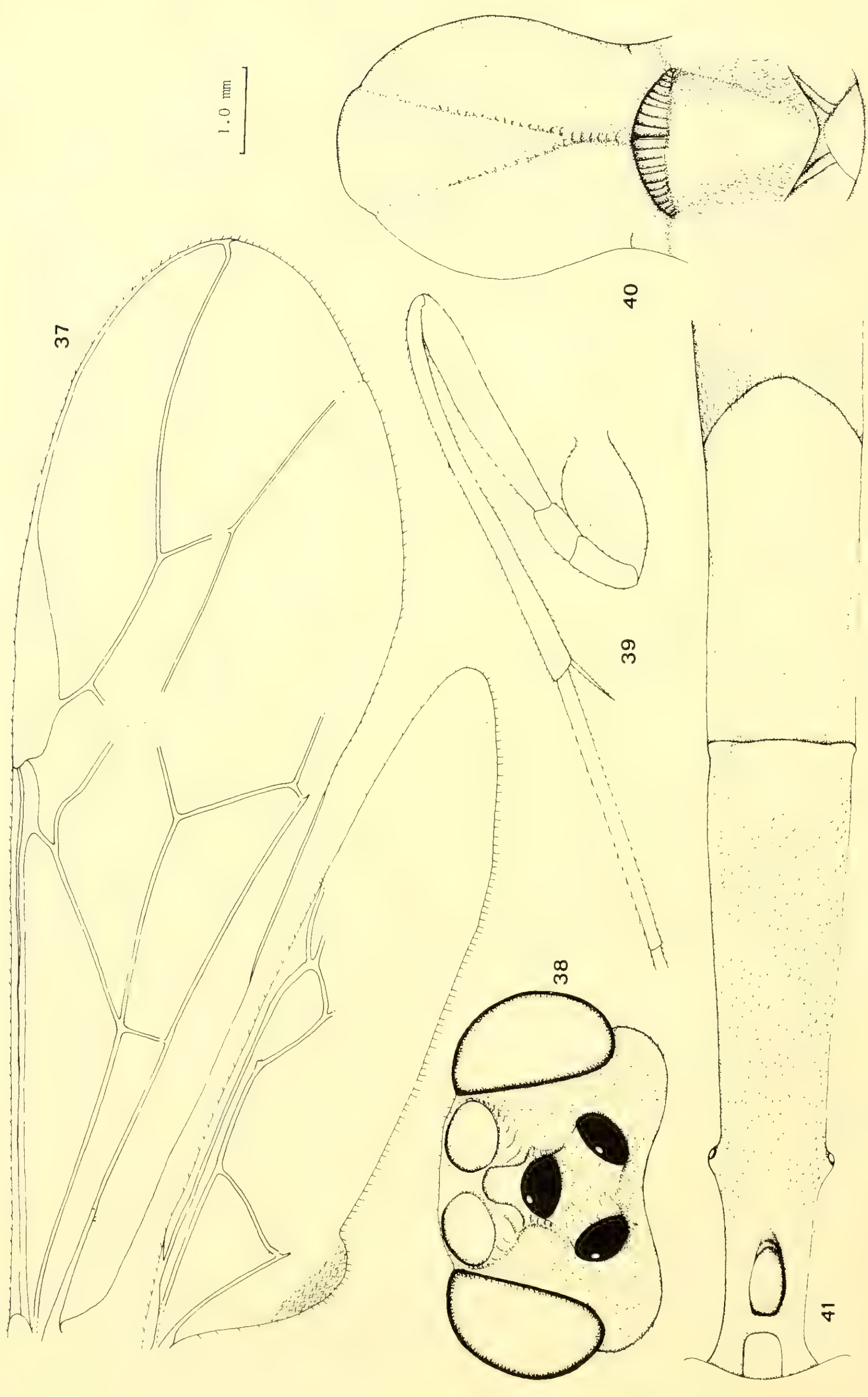
Figs. 18—23. *Amicrocentrum concolor* (Szépligeti), holotype. 18, habitus, lateral aspect; 19, ovipositor; 20, head, dorsal aspect; 21, middle leg; 22, head, frontal aspect; 23, detail of palpi. 18, 19, 21: scale-line; 20, 22: 1.3 × scale-line; 23: 2.6 × scale-line



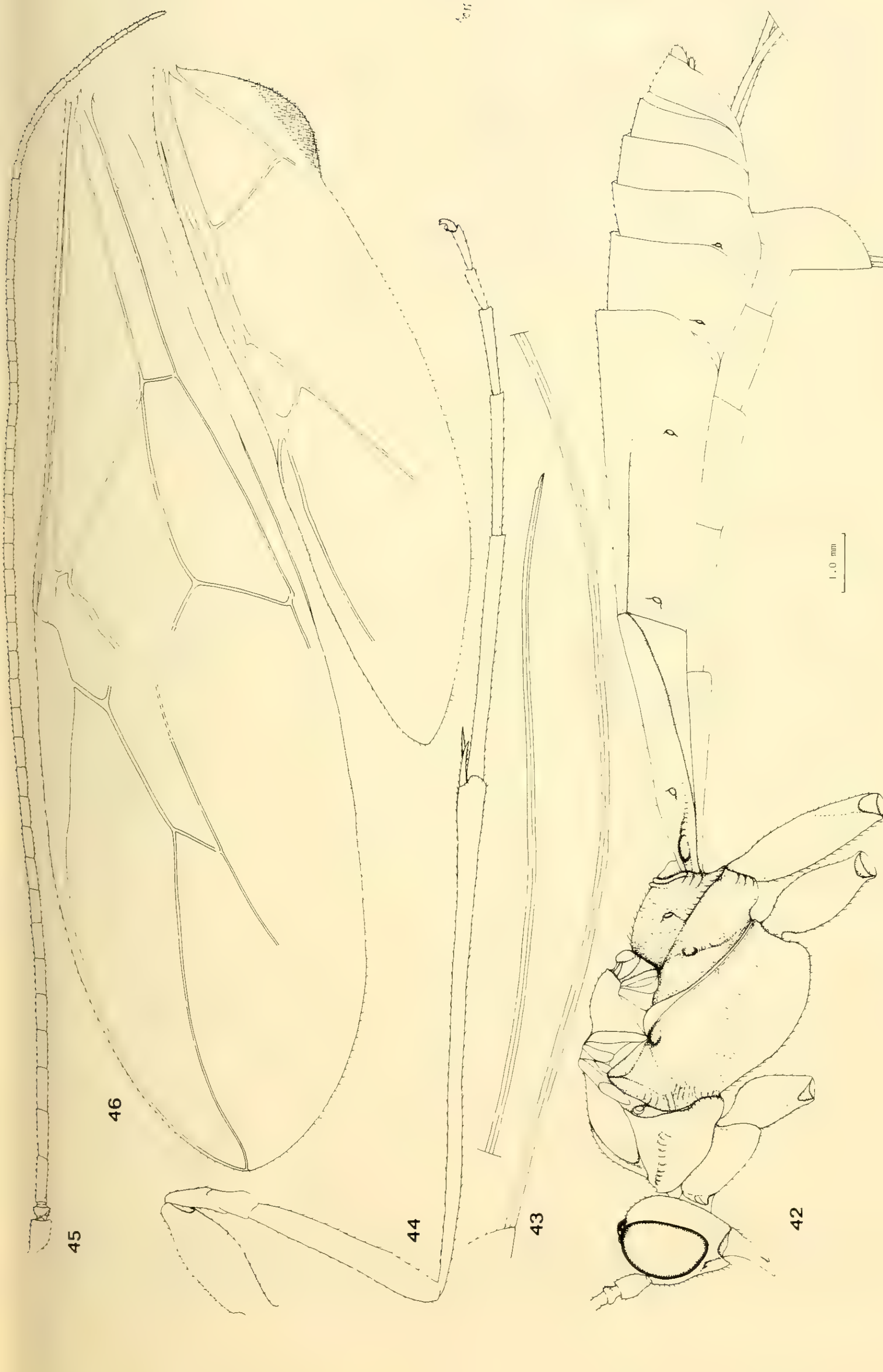
Figs. 24—29. *Amicrocentrum concolor* (Szépligeti), holotype. 24, antenna; 25, wings; 26, apex of antenna; 27, mesonotum, dorsal aspect; 28, detail of pedicellus; 29, 1st and 2nd tergites, dorsal aspect. 24, 25: scale-line; 26: 5.0 × scale-line; 27, 29: 1.3 × scale-line; 28: 2.0 × scale-line



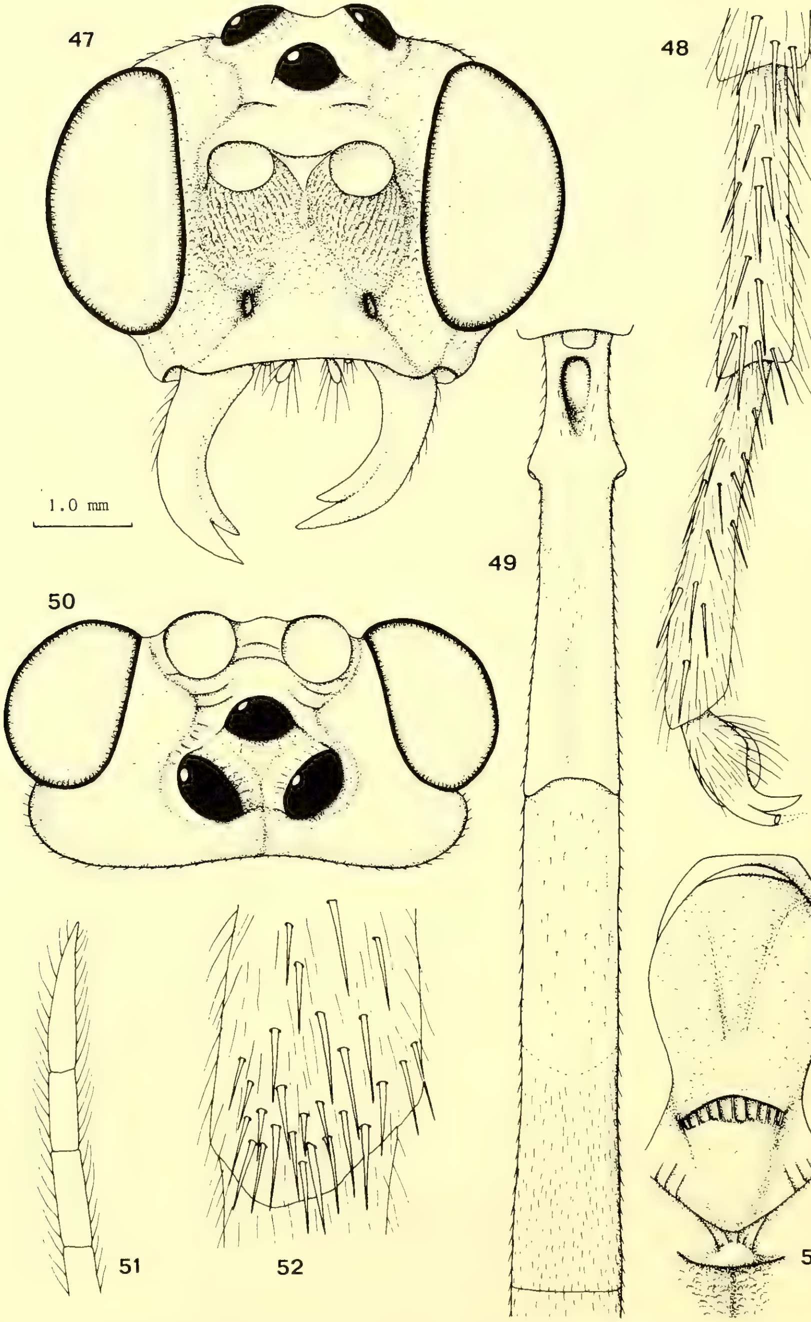
Figs. 30—36. *Amicrocentrum curvinervis* (Cameron), holotype. 30, habitus, lateral aspect; 31, hind telotarsus with full sight on outer hind claw; 32, head, frontal aspect; 33, detail of base of antenna; 34, hind leg; 35, antenna; 36, ovipositor. 30, 34—36: scale-line; 31: 5.0 × scale-line; 32, 33: 2.0 × scale-line



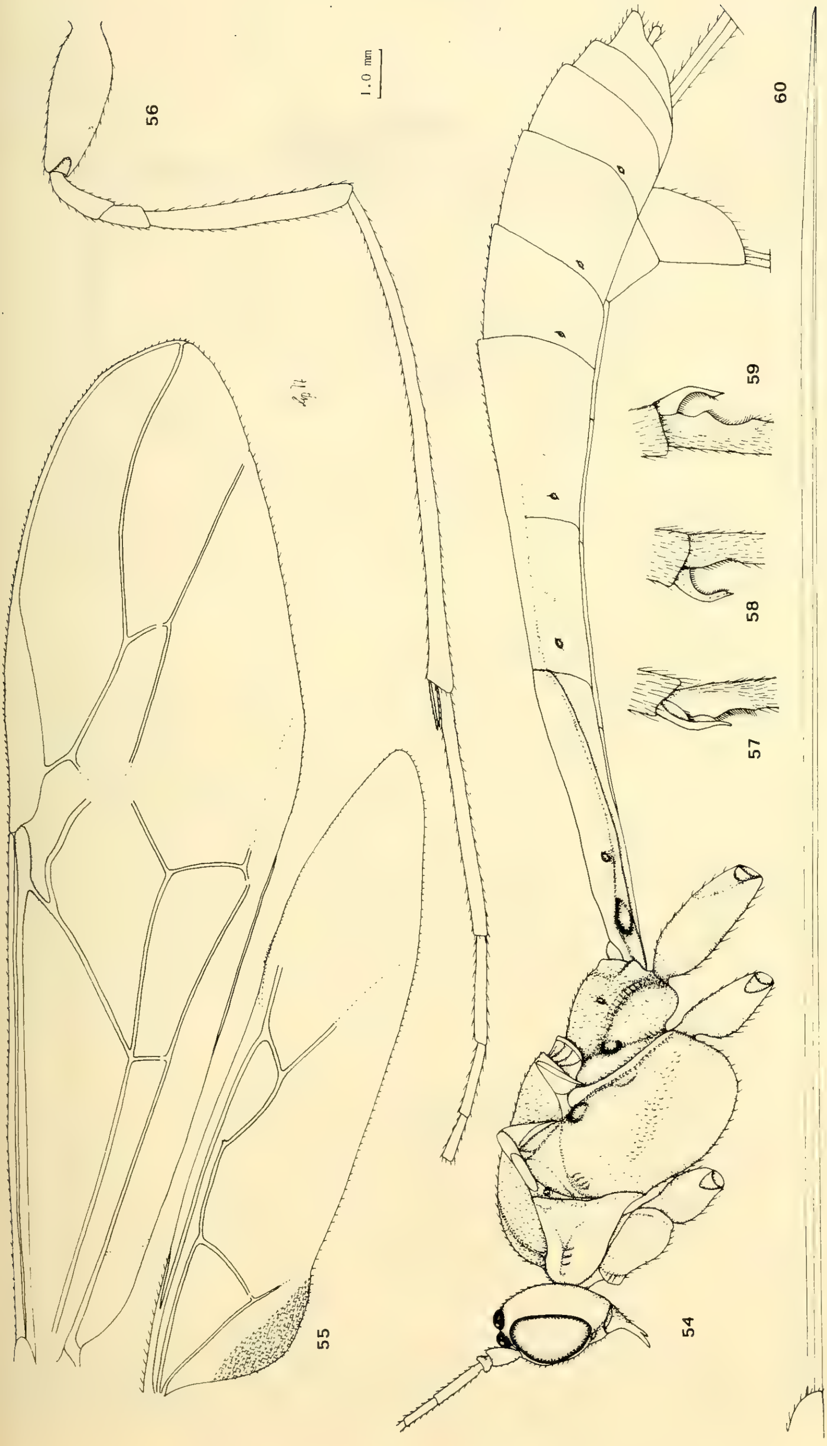
Figs. 37—41. *Amicrocentrum curvinervis* (Cameron), holotype. 37, wings; 38, head, dorsal aspect; 39, middle leg; 40, mesonotum, dorsal aspect; 41, 1st and 2nd tergites, dorsal aspect. 37, 39: scale-line; 38, 40, 41: 2.0 × scale-line



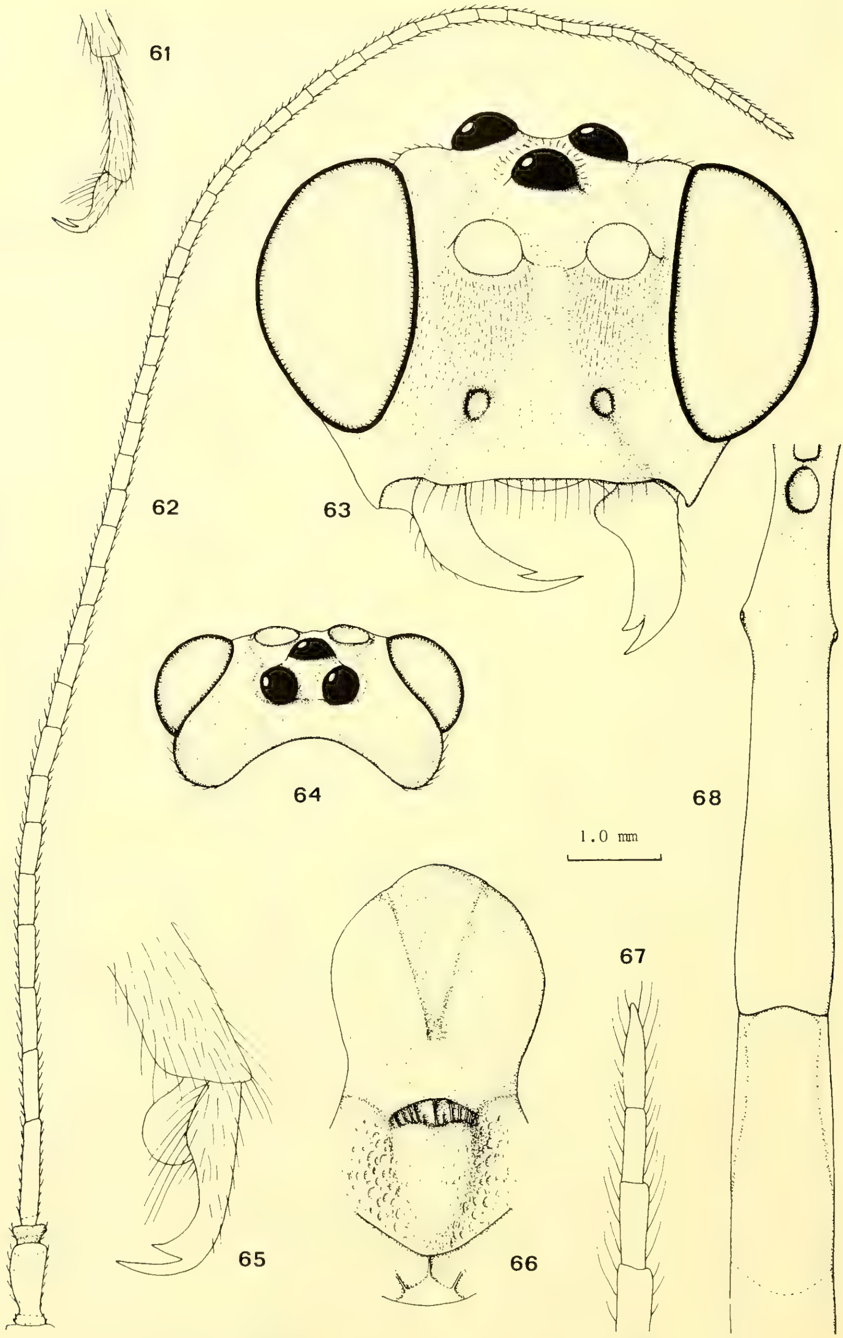
Figs. 42—46. *Amicrocentrum exilis* spec. nov., holotype. 42, habitus, lateral aspect; 43, ovipositor; 44, hind leg; 45, antenna; 46, wings. 42—46: scale-line



Figs. 47—53. *Amicrocentrum exilis* spec. nov., holotype. 47, head, frontal aspect; 48, apex of hind tarsus, outer aspect; 49, 1st—3rd tergites, dorsal aspect; 50, head, dorsal aspect; 51, apex of antenna; 52, apex of hind tibia, outer aspect; 53, mesonotum, dorsal aspect. 47, 50: 2.0 × scale-line; 48, 51, 52: 5.0 × scale-line; 49, 53: scale-line



Figs. 54—56, 60. *Amicrocentrum flavipenne* Granger, lectotype. 54, habitus, lateral aspect; 55, wings; 56, hind leg; 60, ovipositor. 57—59, *Amicrocentrum concolor* (Szépligeti), fore tibial spur of ♀, Kenya, Mtito Andei. 57, lateral aspect; 58, inner aspect; 59, outer aspect. 54—56, 60: scale-line; 57—59: 2.0 × scale-line



Figs. 61—68. *Amicrocentrum flavipenne* Granger, lectotype. 61, apex of middle tarsus; 62, antenna; 63, head, frontal aspect; 64, head, dorsal aspect; 65, inner middle claw; 66, mesonotum, dorsal aspect; 67, apex of antenna; 68, 1st and 2nd tergites, dorsal aspect. 61: 2.0 × scale-line; 62, 64, 66, 68: scale-line; 63: 1.7 × scale-line; 65: 5.0 × scale-line; 67: 4.0 × scale-line

A REVISION OF THE NEW SUBFAMILY XIPHOZELINAE (HYMENOPTERA, BRACONIDAE)

by

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With 45 text-figures

Abstract

A new subfamily is erected for the genera *Xiphozele* Cameron, 1906, and *Distilirella* gen. nov. *Distilirella curvinervosa* gen. et spec. nov., from New Guinea, and the species of *Xiphozele* are described and fully illustrated.

Introduction

In the course of a revision of the Macrocentrinae s.l. I have tried to delimit the subfamily Macrocentrinae with the aid of synapomorphous character-states. One of the genera, which proved to be untenable in the Macrocentrinae because of the lack of synapomorphous character-states is *Xiphozele* Cameron, and a genus with even less apomorphous character-states has now been discovered in New Guinea. The distribution of the Xiphozelinae is restricted to the South East Palaearctic and Oriental regions and New Guinea. There are few specimens of Xiphozelinae in any collection, though they are large, conspicuous insects. Despite this an attempt is made to revise the group. For the scarce literature, see Shenefelt (1969: 174—175) and for the general terminology, see Van Achterberg (1976a: 160—166).

Phylogeny

The new subfamily formed by the genera *Xiphozele* Cameron and *Distilirella* gen. nov. possesses the following remarkable apomorphous character-states:

1. A deep and round laterope situated far from the base of the first metasomal tergite (figs. 18, 28). This is a unique character-state, which, as far as I am aware, does not occur in other subfamilies of the Braconidae; there is at most a rather shallow, elliptical laterope far removed from the base of the tergite, e.g., in the genus *Zele* Curtis (nec auct.). The presence of a laterope is itself a plesiomorphous character-state.

2. The strongly inclivous nervellus of the hind wing, which is exceptional in the Braconidae and probably an apomorphous character-state. Only in the genus *Brulleia* Szépligeti does the same condition appear.

3. The short ovipositor, about equal to the apical height of the metasoma (fig. 1). An ovipositor about as long as the fore wing or somewhat shorter is often associated in the Braconidae with other plesiomorphous character-states. Therefore the short ovipositor of the Xiphozelinae is considered to be an apomorphous state.

4. The first recurrent vein is far antefurcal (fig. 9); it is a general tendency in the Braconidae that apical veins retreat towards the base of the wing. Thus an antefurcal recurrent vein is an apomorphous character-state, while *Brulleia* with its postfurcal first recurrent vein shows the plesiomorphous condition.

5. The presence of an "ophionoid facies" (Gauld & Huddleston, 1976), most pronounced in the yellowish body colour, and the large ocelli and eyes, which are an adaptation to the noctural activity of the parasites. This is probably induced by the nocturnal activity of the caterpillars (Noctuidae!) wherein the egg is deposited.

6. The absence of the dorsal carinae and the medio-basal depression of the first metasomal tergite (fig. 8). As shown by several groups of Braconidae with many other plesiomorphous character-states (e.g., Doryctinae, Helconinae), the presence of at least short basal dorsal carinae and of a medio-basal depression has to be considered to represent a plesiomorphous character-state.

7. The spiracle is situated far from the base of the first tergite. This is a general tendency in the Braconidae (Van Achterberg, 1976b: 36); instead of subbasal spiracles (the plesiomorphous condition) the spiracles are situated more or less submedially because of the petiolation of the first tergite. The slender posterior half of the first tergite (fig. 19) in the Xiphozelinae is also unusual.

8. The reduction of the occipital carina. This carina is present in many not closely related groups of Hymenoptera which show many other plesiomorphous character-states.

9. The presence of the lateral carina of the mesoscutum. A well-developed lateral carina seems to be a late development in the history of the Braconidae.

10. The claws possess a more or less developed ventral lamella (figs. 16, 35). As pointed out by Brothers (1975: 521) simple bifurcate claws (without a lamella) have to be considered a plesiomorphous character-state in the Hymenoptera.

11. The long palpi; length of maxillary palp 1.8—2.3 times height of head. The plesiomorphous condition of the maxillary palp in the Braconidae is a length about equal to the height of the head.

The plesiomorphous character-states of the Xiphozelinae are:

1. The presence of the first transverse anal, the transverse anellan and the transverse radiellan veins. These veins are weakly developed, but they indicate a more complex (and plesiomorphous state of) venation. The same applies to the presence of the second transverse cubital vein and the long radial vein of the fore wing.

2. The presence of a laterope. In the Ichneumonoidea it is most likely an early development and should therefore be considered a plesiomorphous character-state within the Braconidae. It is common in not closely related groups, which show several other plesiomorphous character-states.

3. The large plical (anal) lobe of the hind wing. A well-developed plical lobe

such as present in the Symphyta is a plesiomorphous character-state.

4. The metasomal tergites are equally setose. The reduction of the setosity is a common (apomorphous) condition, but it has not taken place in the Xiphozelinae.

5. The fore tibial spur is rather slender, more or less cylindrical and bears a narrow flange on the inner side. This is the common plesiomorphous character-state in the Hymenoptera-Apocrita.

6. The presence of the prepectal and hypostomal carinae. The presence of these carinae is generally accepted to be a plesiomorphous character-state. The carinae are present in many not closely related groups of Hymenoptera which have many other plesiomorphous character-states in common.

7. The maxillary and labial palpi consist of 6 and 4 segments, respectively, and are well-developed. There is a general tendency for reduction of the palpi (Van Achterberg, 1976b: 35), but in the Xiphozelinae the plesiomorphous character-state still occurs.

8. The first discoidal cell is shortly petiolate. A petiolate first discoidal cell is generally considered to be a plesiomorphous character-state in the Hymenoptera.

More doubtful character-states are:

1. The metasoma is inserted above the hind coxae. Probably this character-state is plesiomorphous, if it is not inserted extremely high as in the Cenocoeliinae and the Evanioidea. A medially inserted metasoma occurs in several subfamilies of Braconidae which are not closely related (e.g., Helconinae, Macrocentrinae, Orgilinae, Amicrocentrinae, Agathidinae, and Xiphozelinae) as well as in the Ichneumonidae (subfamily Labeninae (= Labiinae sensu Townes)).

2. The radiellan cell of the hind wing is more or less widened apicad (figs. 25, 37). Probably (if in a rather moderate manner) this is a plesiomorphous condition.

Less easy to answer is the question of the relationships of the Xiphozelinae. Their inclusion in the Macrocentrinae as done by most previous authors is untenable because of the synapomorphous character-states. The Macrocentrinae have the following synapomorphous character-states: 1—trochantelli apically toothed; 2—plical lobe rather narrow; 3—occipital carina completely absent; 4—claws simple or with a lamella; 5—first recurrent vein far antefurcal. Most of these character-states are absent or at least are not completely present in the Xiphozelinae. The unique apomorphous character-state of the Macrocentrinae, viz., the apically toothed trochantelli, is absent in the Xiphozelinae. The other characters show more or less a tendency to follow the developments in the Xiphozelinae, but the Xiphozelinae have in the round and deep laterope, which is situated far posteriorly, and the strongly inclivous nervellus their own apomorphous character-states not shared by the Macrocentrinae. Of the other apomorphous character-states of the Xiphozelinae the short ovipositor, the ophionoid facies, the reduction of the dorsal carinae and medio-basal depression of the first tergite, and more posteriorly situated spiracle of the first tergite are independently evolved in the Macrocentrinae, because the plesiomorphous condition is common in the Macrocentrinae. The development of the lateral carinae of the mesoscutum, the reduction of the occipital carina and the far antefurcal first recurrent vein may indicate the same origin, but this conclusion is

uncertain because they are general tendencies in the Braconidae. The plesiomorphous character-states not present in the Macrocentrinae are the presence of the transverse anellan and radiellan veins and the large plical lobe of the hind wing.

A candidate for the sister-group of the Xiphozelinae is formed by the Helconinae s.l., because of the genus *Brulleia* Szépligeti. *Brulleia* has also a large plical lobe, an apically dilated radiellan cell, a short second abscissa of the subcostella and an inclivous nervellus. But only the latter is a probable apomorphous character-state, while *Brulleia* has the first discoidal cell widely sessile, maxillary and labial palpi 5 and 3 segmented, respectively, and the transverse radiellan and anellan veins absent. Besides these apomorphous character-states, it has the second transverse anal vein present, the first recurrent vein postfurcal and a complete occipital carina, which are plesiomorphous character-states not present in the Xiphozelinae.

In summary: the position of the Xiphozelinae is uncertain, they are not closely related to the Macrocentrinae s.s. as suggested by other authors. There may be a relationship with the Helconinae s.l., to which they are more closely related than are the Amicrocentrinae.

BIOLOGY

Only in the case of *Xiphozele compressiventris* Cameron is something known about the biology. I have examined two females from South India (Karwar, Karnataka, 14.viii.1907, F. R. Bell (BM)), which were reared from the "pupa" (probably cocoon) of *Ophiusa simillima* Guenée (Lepidoptera: Noctuidae). Watanabe (1969: 327) reported a female bred from a lepidopterous larva feeding on leaves of *Quercus* spec. at Sapporo. The host species seems to belong to the Noctuidae. The parasite-larva left its host on September 7, 1966, and spun a cocoon within which it passed the winter. The adult emerged from the cocoon on March 23, 1967. The dates of capture of the 6 specimens from Japan are between 25.iii and 28.viii. The cocoon is 12—13 mm long, spindle-shaped, thick, dark brown, and somewhat woolly. Because Noctuid larvae are usually active nocturnally, it is likely that this induces the nocturnal activity of the adult parasites.

XIPHOZELINAE subfam. nov.

Diagnosis. — Length of body 12.5—20.0, of fore wing 10.5—16.6 mm; antennal segments of ♀ 53—56, of ♂ 51—54; pedicellus short, transverse and cylindrical (figs. 1, 28); maxillary and labial palpi long, slender, 6- and 4-segmented, respectively; apical segment of antenna with a long spine apically (fig. 2); ocelli large (figs. 12, 24); anterior tentorial pits large, deep (fig. 10); epistomal suture complete; occipital carina absent dorsally; eye bare; apical margin of clypeus thin and differentiated from clypeus (figs. 22, 40); labrum visible frontally; occipital flange narrowly developed; hypostomal carina present (fig. 7); mandible strongly twisted, both its teeth sharp apically and second tooth much shorter than first

tooth (figs. 7, 40); pronope and antescutal depression absent; pronotum convex dorsally and with an upwardly directed lamella anteriorly; propleural lamellae developed (fig. 1); dorso-apical corner of pronotum rounded and more or less protruding posteriad (figs. 18, 28); tegulae almost reaching anterior margin of mesopleuron (fig. 1); mesopleuron slightly protruding anteriorly (fig. 18); lateral carina of mesoscutum present in front of tegulae; lateral and middle lobes of mesoscutum equally convex; prepectal carina strongly developed (figs. 1, 28); precoxal suture rather impressed (fig. 18); metapleural flange or lamella large, and sharp apically (figs. 18, 28); dorsal surface of propodeum not differentiated from its posterior surface (fig. 28); propodeum without areola and tubercles; propodeal spiracle large, more or less elliptical (figs. 18, 28); antepropodeal depression rather wide and deep (fig. 39); notauli present; mesoscutal lobes rather convex; scutellar suture wide, long, deep and with one longitudinal carina (figs. 26, 43); scutellum sculptured posteriorly (figs. 6, 26, 43); metanotum rather flat postero-medially (figs. 18, 26); first discoidal cell shortly petiolate and sharp anteriorly (fig. 9); cuqu 2 present; r 3 more or less curved towards metacarp (figs. 25, 37); nervulus interstitial or nearly so (figs. 9, 37); n. rec. far antefurcal; sides of B 1 parallel or nearly so (figs. 9, 37); CU 1 larger than CU 2; nervellus very long, inclivous and posteriorly curved basad (fig. 25); B 1 closed apically, s 1b present; fringes of wings short; parastigma large (fig. 37); intercostal cell absent; aqu 1 and aqu' present as weakly pigmented stripes (fig. 25); aqu 2 absent; metacarp ends near apex of radial cell (fig. 9); plical lobe very large and normally setose (fig. 37); radiellan cell widened apicad after the completely developed rqu' (figs. 25, 37); base of radiella as sclerotized as basella; basella and second abscissa of subcostella short (fig. 9); discoidella absent, but exceptionally a remnant is present (fig. 38); legs slender, length of hind tibia ca. 1.3 times its femur; length of femur and tibia of hind leg 9.0—10.1 and 11.8—15.0 times their width, respectively; hind tibial spurs long, straight, setose and sharp apically; inner hind tibial spur 0.6—0.7 times its basitarsus; hind basitarsus without a ventral row of setae; tarsal claws of ♀ with a ventral lamella (figs. 15, 34); shape of inner hind claw equal to its outer claw; fore tibial spur rather slender, more or less cylindrical and with a narrow flange or lamella (figs. 20, 21); trochantelli without teeth, simple apically; apex of hind tibia bristly (fig. 31) or with slender pegs (fig. 11); metasoma inserted medially between dorsal surface of propodeum and the dorsal level of base of hind coxae (figs. 1, 18); length of first metasomal tergite 5.5—6.4 times its apical width; sides of first tergite (sub-)parallel; first tergite flat or convex medio-basally; dorsal carinae of first tergite absent (fig. 39); laterope deep, round and large, at basal third of first tergite, just in front of spiracle and far removed from the base of the tergite (figs. 18, 19); dorsope absent; metasoma evenly setose; second tergite smooth as following tergites, with a weakly developed lateral crease (fig. 28); metasoma strongly compressed apicad (fig. 19); ovipositor straight and with a shallow subapical notch (figs. 1, 28); length of ovipositor sheath 0.05—0.07 times fore wing; hypopygium large and truncate apically (fig. 28).

Distribution. — South East Palaearctic and Oriental regions and New Guinea.

Key to genera of the Xiphozelinae

1. Prepectal carina reaches anterior margin of mesopleuron (fig. 1); occipital carina far removed from hypostomal carina ventrally (fig. 7); basella of hind wing straight (fig. 5); nervulus abruptly bent distad and with a sclerome (figs. 17, 27); scutellum without a lateral carina (fig. 26); tarsal claws of ♀ with only one narrow submedial lamella (fig. 15) . . . . *Xiphozele* Cameron

— Prepectal carina remains far removed from the anterior margin of mesopleuron (fig. 28); occipital carina reaching hypostomal carina ventrally (fig. 32); basella strongly curved (fig. 45); nervulus straight (fig. 33), without a sclerome; scutellum with a lateral carina (fig. 43); tarsal claws of ♀ with two lamellae, the 2nd lamella subapically attached to the submedial lamella (fig. 35) . . . . *Distilirella* gen. nov.

Xiphozele Cameron (figs. 1—27)

Cameron, 1906, Entomologist 39: 204.
Enderlein, (1918) 1920, Arch. Naturgesch. 84A (11): 219 *(Cerotopia)*.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 174—175.
Watanabe, 1969, Proc. ent, Soc. Wash. 71(3): 325—327, figs. 8—9.
Sharma, 1975, Oriental Ins. 9(2): 173—175, figs. 1—5.

Type-species: *Xiphozele compressiventris* Cameron

Diagnosis. — Apex of scapus rather roundly emarginated (fig. 18); occipital carina far removed from hypostomal carina (fig. 7); eyes not (fig. 22) or scarcely visibly emarginated at inner side (fig. 10); teeth of mandible robust (fig. 10); apical margin of clypeus more (fig. 22) or less (fig. 10) emarginated; prepectal carina reaches anterior margin of mesopleuron (figs. 1, 18); episternal scrobe absent or nearly so (fig. 18); scutellum without a lateral carina (fig. 26), widely sculptured posteriorly (figs. 6, 26); cu 1 straight or nearly so (fig. 9); nervulus abruptly bent distad, much narrower than surrounding veins, interstitial with basal vein and with a sclerome (figs. 17, 27); SM more (fig. 17) or less (fig. 27) bare apically; basella straight; metacarpella weakly curved or rather straight (figs. 5, 25), exceptionally strongly curved (fig. 9 in Watanabe, 1969); tarsal claws of ♀ setose and with a submedial lamella (figs. 15, 16); tarsal claws of ♂ with a large, somewhat inward directed and apically sharp lamella (figs. 13, 14); laterope deep (fig. 8) or very deep (fig. 19), more or less removed from each other; ovipositor sheath stout (fig. 1), but unknown of *burmensis*.

Distribution. — Australian (New Guinea), Oriental and South East Palaearctic: two species.

Note. — Apomorphous character-states of *Xiphozele* are: 1—nervulus abruptly bent distad; 2— SM more or less bare; 3—sclerome present in fore wing; 4—claws with a ventral lamella; 5—occipital carina absent ventrally; 6—ovipositor sheath stout; 7—prepectal carina present antero-dorsally, reaching anterior edge of mesopleuron. Plesiomorphous character-states are: 1—basella straight; 2—metacarpella weakly curved or almost straight; 3—scutellum without a lateral carina.

Key to species of *Xiphozele* Cameron

1. Mesoscutal lobes brownish yellow; wing membrane hyaline; vertex punctulate or smooth (fig. 12); clypeal margin weakly concave medially (fig. 10); submedial cell mainly bare (fig. 17), exceptionally with ca. 30 setae . . . . *compressiventris* Cameron

— Mesoscutal lobes mainly dark brown; wing membrane more or less brownish; vertex punctate (fig. 24); clypeal margin rather deeply concave medially (fig. 22); submedial cell mainly sparsely setose (fig. 27), usually with at least ca. 30 setae . . . . *burmensis* Sharma

Xiphozele compressiventris Cameron (figs. 1—17)

Cameron, 1906, Entomologist 39: 205.
Enderlein, (1918) 1920, Arch. Naturgesch. 89 A(11): 220, fig. 11 (*Cerotopia corneimacula*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 174—175.
Watanabe, 1969, Proc. ent. Soc. Wash. 71(3): 325—327, figs. 8, 9.
Sharma, 1975, Oriental Ins. 9(2): 173, 175.

Redescribed after a ♀ from Sri Lanka, compared with holotype. Length of body 15.0, of fore wing 11.5 mm.

Head. — Antennal segments 53, length of 3rd segment 1.3 times 4th segment, length of 3rd and 4th segments 4.0 and 3.2 times their width, respectively, penultimate segments 2.3 and 3.0 times their width, respectively, and apical segment with a long spine (fig. 2); length of maxillary palp 2.2 times height of head; dorsal length of eye 3.6 times temple; temple roundly receding (fig. 12); POL : ∅ ocellus : OOL = 10 : 9 : 3; frons almost flat and smooth; vertex mainly smooth; occipital carina absent, except for a lateral remnant at middle level of eyes (fig. 7, in all other specimens examined there is at least a vague remnant present); face convex, punctulate, shiny, but coriaceous near the medial convexity; clypeus strongly convex, punctulate; apical margin of clypeus weakly concave (fig. 10); length of malar space 0.6 times basal width of mandible; malar suture weakly developed (fig. 10).

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum smooth, but medially and posteriorly somewhat crenulate and weakly striate below the deep antero-dorsal depression (fig. 1); epicnemial area mainly weakly punctate; precoxal suture coarsely reticulate-punctate and its surroundings weakly punctate; pleural suture densely and narrowly crenulate, rather shallow and narrow (fig. 1); metapleuron coarsely reticulate; notauli distinctly impressed, but smooth (fig. 6); mesoscutal lobes indistinctly punctulate-coriaceous; side of scutellum remotely crenulate; metanotum with one medial carina and a pair of parallel carinae sublaterally (fig. 6); surface of propodeum rather finely and closely reticulate, but anteriorly and posteriorly narrowly smooth, without a medial carina, except for a weakly developed short part anteriorly.

Wings. — r1 : r2 : r3 = 16 : 20 : 52; cuqu 1 : r2: cuqu 2 = 17 : 20 : 12, r3 curved anteriad; metacarpella curved (fig. 5, in some other specimens rather strongly);

SM with ca. 10 setae (in other specimens exceptionally as many as ca. 30 setae).

Legs. — Hind coxa punctulate; length of femur, tibia and basitarsus of hind leg 9.0, 11.8 and 10.6 times their width, respectively; length of hind tibial spurs 0.7 and 0.6 times their basitarsus.

Metasoma. — Length of 1st tergite 6.0 times its apical width, its surface mainly smooth (fig. 8), but weakly transversely aciculate medially and weakly punctate posteriorly; base of 1st tergite tube-shaped and with a pair of short ventral carinae (fig. 1); whole 1st tergite convex, but basally weakly, and its spiracles not protruding; length of ovipositor sheath 0.05 times fore wing.

Colour. — Brownish yellow; tips of mandibles, direct surroundings of ocelli, wing veins mainly, more or less dark brown; apical half of metasoma somewhat infuscated; base of 1st tergite, tibiae and tarsi rather whitish yellow; wing membrane hyaline.

Holotype (only type-specimen) in BM; type-locality: Sikkim; no. 3.c.683. According to Mr. T. Huddleston (in litt.), who was kind enough to examine the type, this specimen has the submedial cell bare except for about 20 setae and the mesoscutum is entirely without any dark brown coloration. The specimen figured and redescribed is from Kandy: "E. Comber, Feb.'10, Kandy (Sri Lanka)", "1910/ 255", "*Cerotopia corneimaculata* End., G. Nixon, det 1948" (BM). Additionally, 10 ♀ and 2 ♂ have been examined from New Guinea (Humboldt Bay District, Bewani Mts.), Indonesia (Sumatra, Sukaranda, type of *Cerotopia corneimacula* Enderlein), Sarawak (Kuching, at night, in house), Sri Lanka (Kandy, 2000 ft.), India (Karwar, Karnataka, S. India, ex *Ophiusa simillima* Guenée), China (Kouy Tcheou, Se Tchouen), Taiwan (Sunmoon Lake) and Japan (Wakayama; Hayatuki, Toyama, Honsyu) (BM, EI, TC, USNM, MNHN, PAN, RMNH). Variation: antennal segments of ♀ 56 (1 specimen), of ♂ 51 or 53 (2 specimens), length of ovipositor sheath 0.05 times fore wing; length of fore wing 10.5—16.6, of body 14.2—20.0 mm; length of 1st tergite 5.8—6.0 times its apical width; length of metasoma 2.5—2.6 times length of metasoma.

Xiphozele burmensis Sharma (figs. 18—27)

Sharma, 1975, Oriental Ins. 9(2): 173—175, figs. 1—5.

Holotype, ♀ (according to the original description, but apical part of metasoma and all claws lost), length of body (without apical half of metasoma): 12.0, of fore wing 13.6 mm.

Head. — Remnant of antenna consists of 8 segments (antennal segments of paratype 50, of ♂ from China 55), length of 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 4.1 and 3.3 times their width, respectively, penultimate segments absent but in ♂ from China 2.0 and 1.6 times their width and apical segment with a long spine; length of maxillary palp 1.8 times height of head; dorsal length of eye 2.8 times temple; temple rounded behind (fig. 24); POL : ⌀ ocellus : OOL = 28 : 13 : 15; frons mainly flat, smooth; occipital carina absent, but dorso-laterally a weakly developed and short remnant is present (as in both other specimens examined); vertex punctate (fig. 24); face convex, punctate, with a

short medio-dorsal ridge (fig. 22); clypeus strongly convex, densely punctate; length of malar space 0.6 times basal width of mandible; malar suture absent.

Mesosoma. — Length of mesosoma 1.2 times its height; side of pronotum smooth dorsally, rugulose with some crenulae ventrally, and medially depressed, with some crenulae (fig. 18); epicnemial area punctate and somewhat rugose; precoxal suture coarsely rugose-reticulate; pleural suture indistinctly crenulate, narrow, ventrally smooth except for some crenulae (fig. 18); metapleuron reticulate-carinate; notauli only in posterior half distinctly impressed and crenulate, anteriorly only rugulose (fig. 26); mesoscutal lobes punctulate; side of scutellum somewhat indistinctly rugose; metanotum with 3 carinae medially and a pair of submedial carinae (fig. 26); surface of propodeum coarsely transversely reticulate-rugose, with a short carina anteriorly, situated in a weak depression.

Wings. — r 1 : r 2 : r 3 = 29 : 49 : 139; cuqu 1 : r 2 : cuqu 2 = 38 : 49 : 26; r 3 weakly curved towards metacarp; metacarpella rather straight, weakly curved (fig. 25); SM with ca. 80 setae.

Legs. — Hind coxa weakly and remotely punctate; all tarsal claws absent; length of femur, tibia and basitarsus of hind leg 10.1, 12.8 and 11.0 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times their basitarsus.

Metasoma. — Length of 1st tergite 5.5 times its apical width, its surface mainly smooth in front of spiracle, behind spiracle rugose and with a medial crest-shaped carina (fig. 19); whole 1st tergite distinctly convex; spiracles weakly protruding; shape and length of ovipositor sheath unknown.

Colour. — Brownish yellow; tips of mandibles, apices of medial antennal segments (of paratype), stemmaticum and its surroundings, wing veins and mesoscutal lobes mainly, more or less dark brown; hind tarsus whitish yellow; wing membrane somewhat brownish, more pronounced near sclerome (fig. 27).

Holotype in NR: "N. E. Burma, Kambaiti, 2000 m, 19/5, 1934, Malaise", "Riksmuseum Stockholm", "Holotype *Xiphozele burmensis* V. Sharma, 1974". One paratype: topotypic, NR, metasoma absent, length of fore wing 14.4 mm, SM with ca. 30 setae, vertex coarsely punctate, colour as holotype, POL : ∅ ocellus : OOL = 12 : 10 : 5, claws with a ventral lamella, somewhat more developed than in ♀ of *compressiventris* (fig. 16). Additionally examined 2 ♂ from China: "Suifu, SZ., China, VI. 1—21, 1928, alt. 1000—1500, D. C. Graham Coll." (USNM); tarsal lamella enlarged in respect to the lamella of ♀, about equally shaped as lamella of ♂ of *compressiventris* (fig. 13); length of metasoma 2.7 times length of mesosoma; length of fore wing 13.8, of body 17.6 mm; metasoma infuscated apically, further equally coloured as holotype; SM densely setose. Second male is from Shanghai (1898, J. de Joannis, MNHN) with wings only weakly infuscate, SM with 24 setae, clypeus less concave than in type, length of fore wing 12.1 mm and of body 16.1 mm.

Note. — *X. burmensis* is closely related to *compressiventris* and is rather variable. The characters given by Sharma (1975: 175) are not suitable for separation of the two species. Firstly because she confuses Cameron's meaning of the term "metanotum" (= propodeum) with the modern meaning of this term. Secondly the length of the metasoma in respect to the mesosoma is variable; the male of

burmensis from China has a comparatively longer metasoma (2.7 times mesosoma) even than several specimens of *compressiventris* (2.5—2.6 times). Finally the differences in length of the body of parasites are usually unsuitable for species separation, as proven again by the small series examined for this revision.

Distilirella gen. nov. (figs. 28—45)

Etymology: from "distantia" (Latin for "remoteness") and "lirella" (Latin for a "small ridge"), because the prepectal carina is remote from the anterior edge of the mesopleuron. Gender: feminine.

Type-species: *Distilirella curvinervosa* spec. nov.

Diagnosis. — Apex of scapus slightly inclivous (fig. 28); occipital carina reaching hypostomal carina ventrally, far above mandibular base (fig. 32); eyes not emarginated, at most with a scarcely visible bend on the inner sides (fig. 40); teeth of mandible rather slender (fig. 40); apical margin of clypeus straight medially; prepectal carina remains far removed from anterior margin of mesopleuron (fig. 28); episternal scrobe deep and rather round (fig. 28); scutellum with a curved lateral carina, which is absent posteriorly (fig. 43); scutellum narrowly sculptured posteriorly (fig. 43); cu 1 weakly sinuate (fig. 37); nervulus straight, only slightly narrower than surrounding veins, slightly postfurcal and without a sclerome (fig. 33); SM setose, but in basal half less densely setose than in apical half; basella and metacarpella strongly curved (fig. 45); tarsal claws of ♀ indistinctly yellowish, pectinate and with a submedial lamella at which another subapical lobe is situated (figs. 34, 35); tarsal claws of ♂ bifurcate, without lamella (figs. 41, 42); laterope very deep, almost touching each other (fig. 39); ovipositor sheath rather slender, its sides subparallel (fig. 28).

Distribution. — Australian (New Guinea): one species.

Note. Apomorphous character-states of *Distilirella* are: 1—basella and metacarpella strongly curved; 2—tarsal claws of ♀ with double lamellae; 3—scutellum with a lateral carina. Additional plesio-morphous character-states are: 1—nervulus straight and equally developed; 2—SM setose; 3—sclerome of fore wing absent; 4—claws of ♂ bifurcate; 5—ventral half of occipital carina present; 6—ovipositor sheath slender; 7—prepectal carina remains far removed from anterior margin of mesopleuron.

Distilirella curvinervosa spec. nov. (figs. 28—45)

Holotype, ♀, length of body 12.5, of fore wing 11.7 mm.

Head. — Antennal segments 47 (but apical segments absent), length of 3rd segment 1.3 times 4th segment; length of 3rd and 4th segments 5.1 and 4.0 times their width, respectively, and both penultimate segments absent (in allotype they are 2.3 and 3.0 times their width and apical segment with a long spine (fig. 36)); length of maxillary palp 2.3 times height of head; dorsal length of eye 3.4 times temple; temple roundly receding and punctulate (fig. 44); POL : ∅ ocellus : OOL = 9 : 8 : 8; frons weakly concave and smooth; ventral half of occipital carina completely present, reaching middle level of eye (fig. 32); face punctulate, weakly

convex and with a small tubercle dorso-medially (fig. 40); clypeus convex, punctulate; length of malar space 0.7 times basal width of mandible; malar suture almost absent (fig. 40).

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum deeply depressed medio-anteriorly and remotely crenulate (fig. 28), its remaining part mainly smooth; epicnemial area smooth, except for some crenulae; precoxal suture with some spaced punctures, its surroundings indistinctly punctulate; pleural suture narrowly crenulate, rather shallow and narrow; metapleuron rugose-reticulate, but dorsally mainly smooth; notauli rather shallow, completely and narrowly crenulate (fig. 43); mesoscutal lobes weakly punctulate; side of scutellum smooth; metanotum with 2 parallel carinae submedially (fig. 43); surface of propodeum mainly smooth between the carinae, with a long medial carina anteriorly (fig. 39) and posteriorly with several more or less transverse carinae, bordered by a carina latero-posteriorly.

Wings. — r 1 : r 2 : r 3 = 17 : 20 : 60; d 1 : d 2 = 1 : 35; cuqu 1 : r 2 : cuqu 2 = 13 : 20 : 12; r 3 strongly curved anteriad; radiella weakly curved basally (fig. 37).

Legs. — Hind coxa punctulate; length of femur, tibia and basitarsus of hind leg 9.9, 15.0 and 15.6 times their width, respectively; length of hind tibial spurs 0.6 and 0.5 times their basitarsus.

Metasoma. — Length of 1st tergite 6.4 times its apical width, its surface smooth, flat in front of spiracles and convex behind spiracles; spiracles of 1st tergite slightly protruding; length of ovipositor sheath 0.07 times fore wing.

Colour. — Brownish yellow; stemmaticum, ovipositor sheath and most wing veins dark brown; flagellum and outer aspect of scapus infuscated; hind tarsus whitish yellow.

Holotype in TC: "Wau, N. Guinea, October, 1969, P. Shanahan".

Paratype: 1 ♂ (allotype, RMNH): "Museum Leiden, Nieuw Guinea Exp., K.N.A.G. 1939, Araboebivak, 6.XI.1939". Antennal segments of allotype 54; frons with some microsculpture laterally; nervellus with a short ramellus (d'), resulting in a posteriorly broken nervellus (fig. 38), in left wing less developed than in right wing; length of fore wing 11.8 mm, length of 1st tergite 6.1 times its apical width.

ACKNOWLEDGEMENTS

I wish to express my sincere thanks to the following persons for the loan of types and/or gifts of unidentified specimens. The abbreviations used for the collections are given in parentheses. Dr. V. K. Gupta, Dept. of Zoology, Delhi; Dr. K. J. Hedqvist, Naturhistoriska Riksmuseet, Stockholm (NR); Mr. T. Huddleston, British Museum (Natural History), London (BM); Dr. E. Kierych, Instytut Zoologii, Warsaw (PAN); Dr. P. M. Marsh, USDA, U.S. National Museum, Washington (USNM); Drs. M. Suwa & C. Watanabe, Entomological Institute, Sapporo (EI); Dr. H. K. Townes, American Entomological Institute, Ann Arbor (TC); Mr. B. Sigwalt & Dr. S. Kelner-Pillault, Muséum National d'Histoire Naturelle, Paris (MNHN); (RMNH) = Rijksmuseum van Natuurlijke Historie, Leiden.

LITERATURE

Achterberg, C. van, 1976a. A revision of the tribus Blacini (Hym., Braconidae, Helconinae). — Tijdschr. Ent. 118 (7): 159—322, figs. 1—476.

———, 1976b. A preliminary key to the subfamilies of the Braconidae (Hym.). — Tijdschr. Ent. 119 (3): 33—78, figs. 1—123.

Brothers, D. J., 1975. Phylogeny and classification of the aculeate Hymenoptera, with special reference to Mutillidae. — Univ. Kansas Sci. Bull. 50 (11): 483—648, figs. 1—101.

Cameron, P., 1906. On some Braconidae from the Himalaya. — Entomologist 39: 204—206.

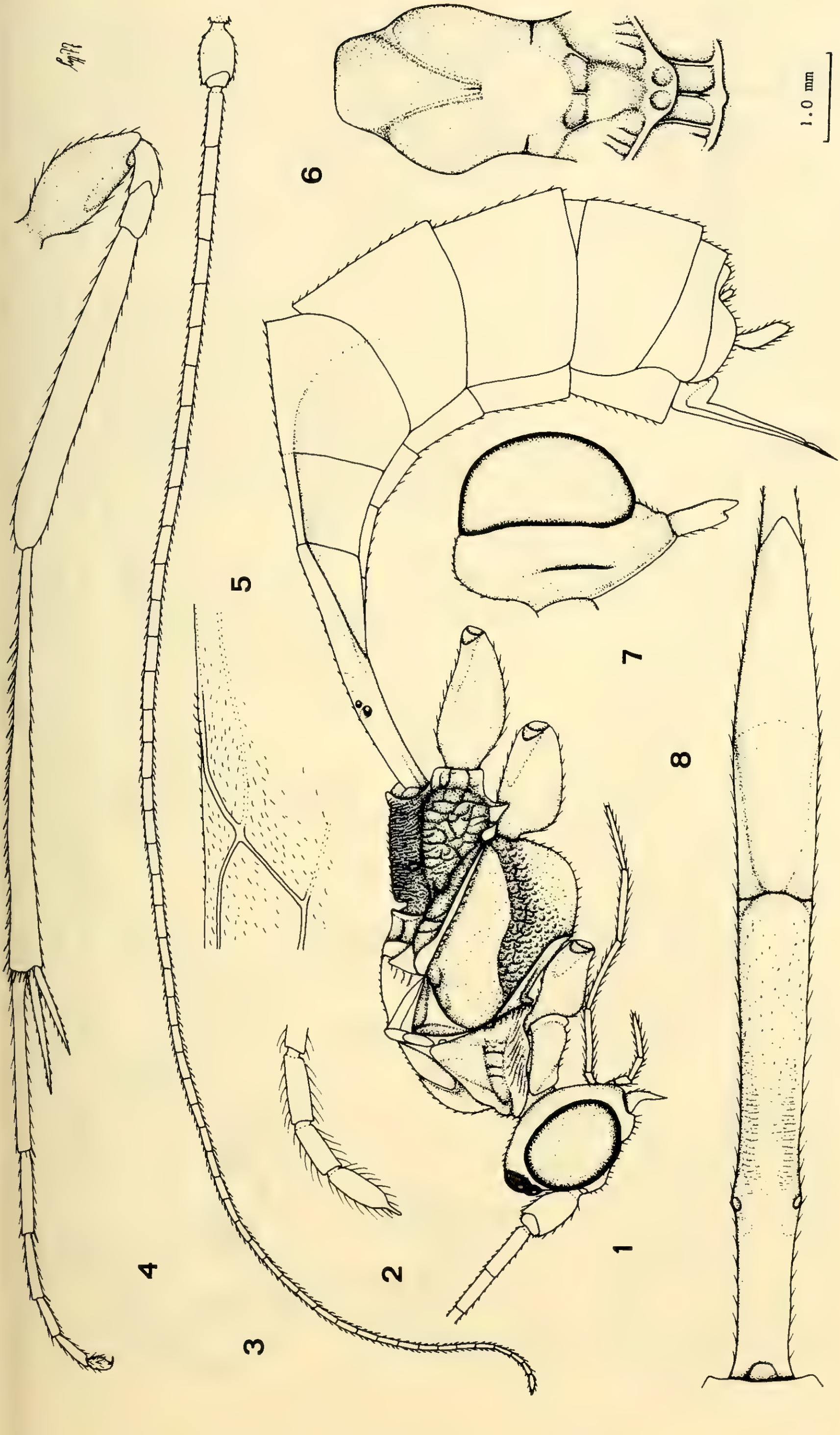
Enderlein, G., (1918) 1920. Zur Kenntnis aussereuropaïscher Braconiden. — Arch. Naturgesch. 84 (A, 11): 51—224, Figs. 1—11.

Gauld, I. D. & T. Huddleston, 1976. The nocturnal Ichneumonoidea of the British Isles, including a key to the genera. — Entomologist's Gaz. 27: 35—49, figs. 1—20.

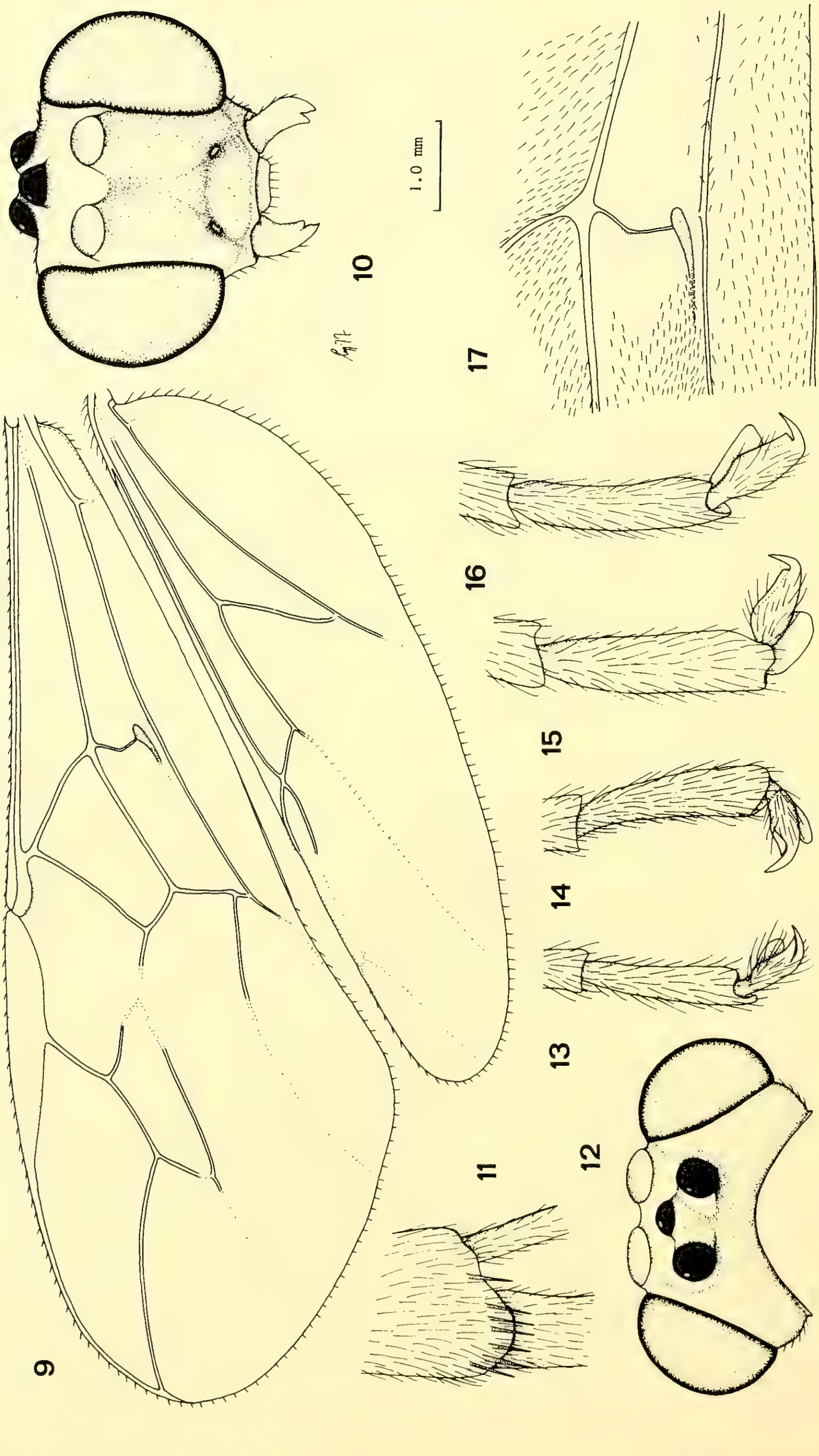
Sharma, V., 1975. A new species of *Xiphozele* (Hym., Braconidae, Macrocentrinae). — Oriental Ins. 9 (2): 173—175, figs. 1—5.

Shenefelt, R. D., 1969. Hymenopterorum Catalogus (nov. ed.) Part 4. Braconidae 1:1—176. — Junk, 's-Gravenhage.

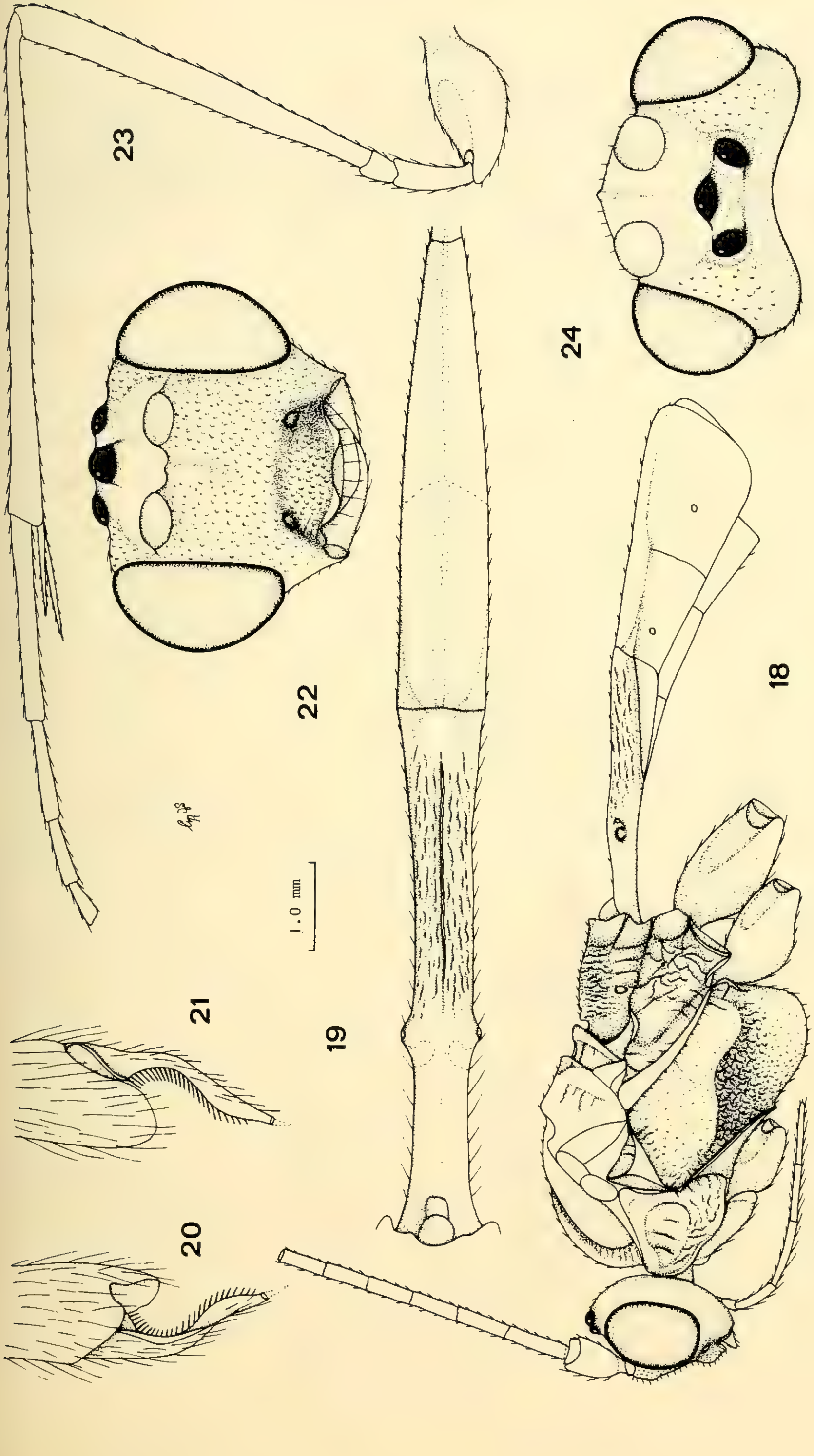
Watanabe, C., 1969. Notes on the genera *Zele* Curtis and *Xiphozele* Cameron, with special reference to the species in Japan (Hym., Braconidae). — Proc. ent. Soc. Wash. 71 (3): 318—328, figs. 1—9



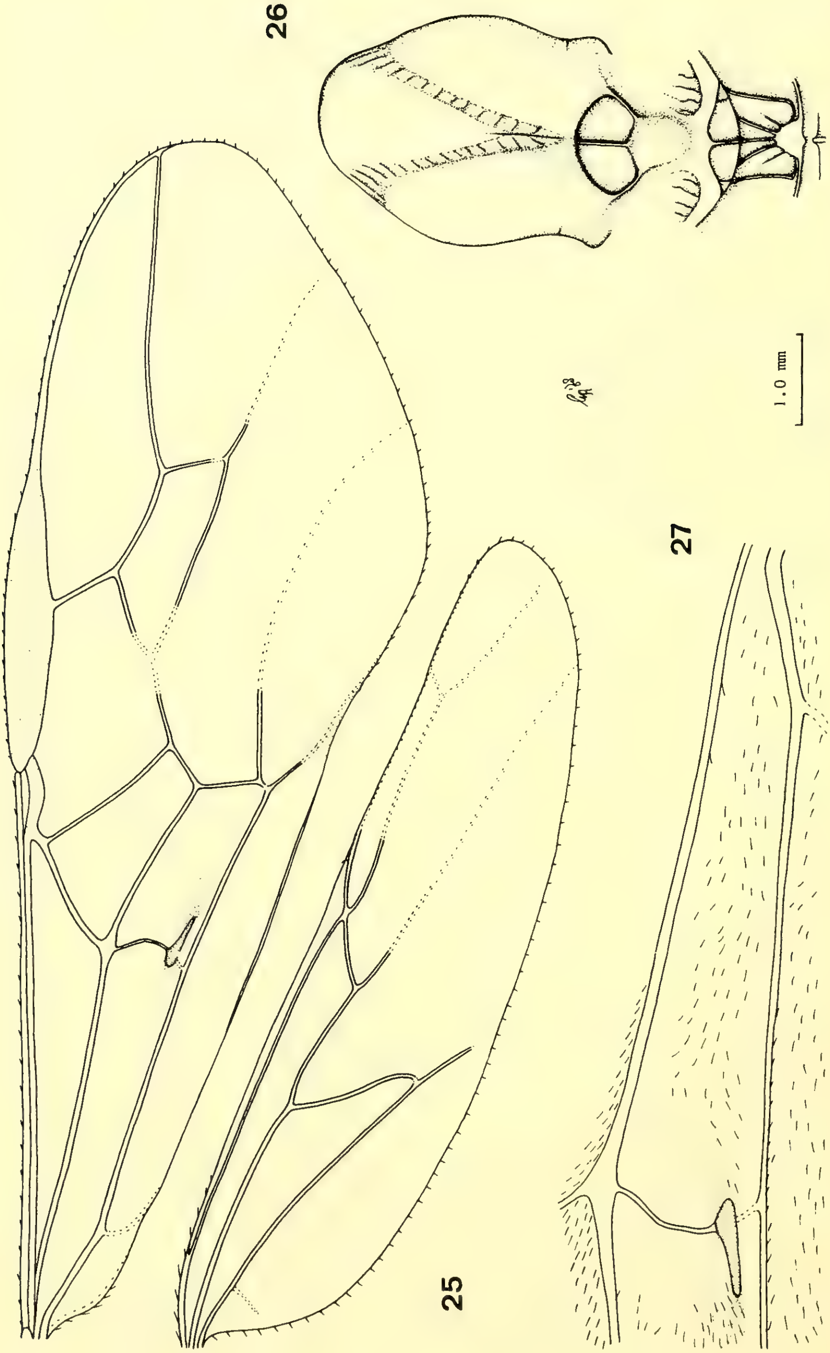
Figs. 1—8, *Xiphozele compressiventris* Cameron, ♀, Sri Lanka, Kandy. 1, habitus, lateral aspect; 2, apical segments of antenna; 3, antenna; 4, hind leg; 5, detail of basella and metacarpella; 6, mesonotum, dorsal aspect; 7, temple, latero-posterior aspect; 8, 1st—3rd metasomal tergites, dorsal aspect. 1, 3, 4: scale-line; 2: 5.0 × scale-line; 5—8: 2.0 × scale-line.



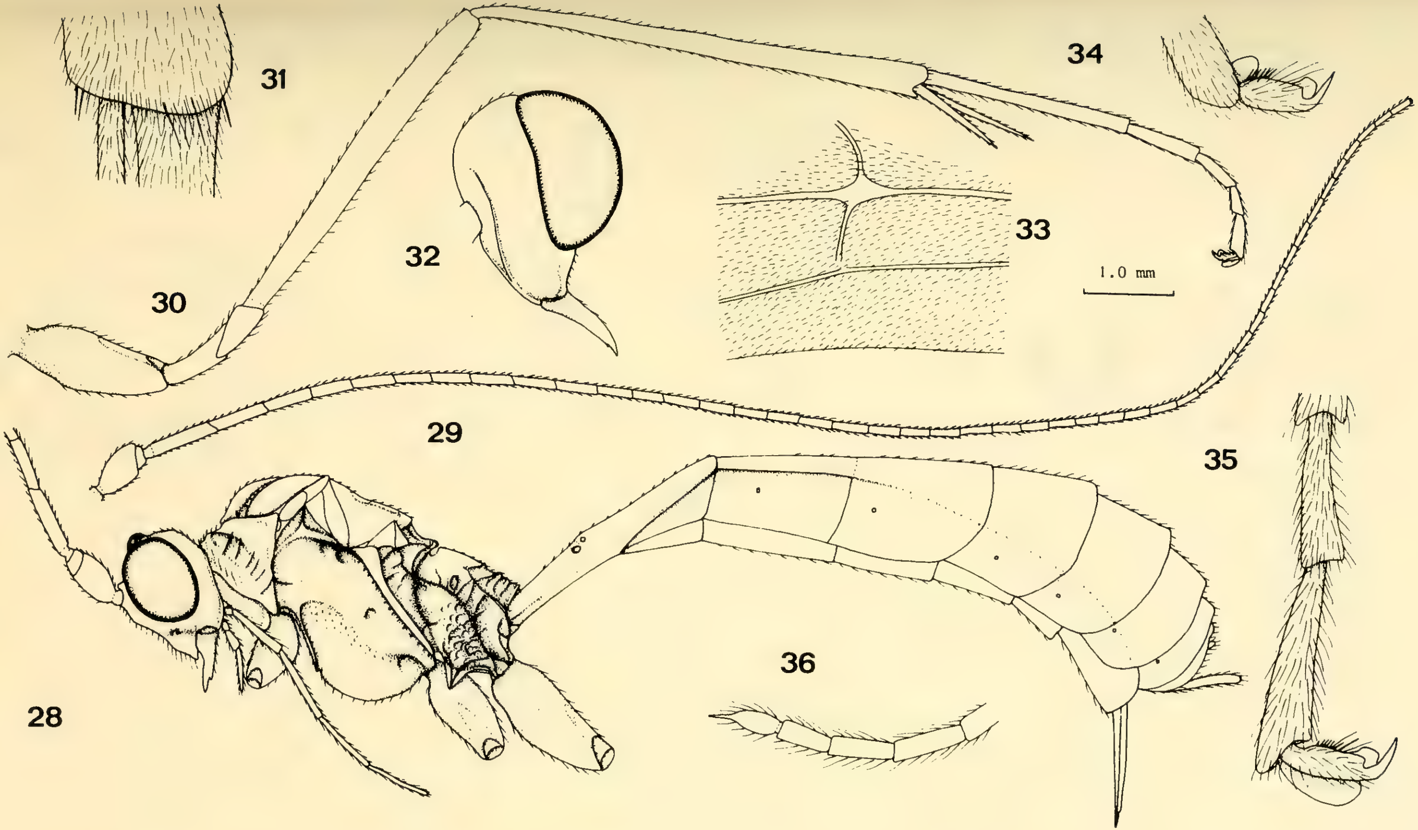
Figs. 9—17, *Xiphozele compressiventris* Cameron, ♀, Sri Lanka, Kandy, but 13 and 14 of ♂, Taiwan, Sunmoon Lake. 9, wings; 10, head, frontal aspect; 11, apex of hind tibia, outer aspect; 12, head, dorsal aspect; 13, fore claw of ♂; 14, hind claw of ♂; 15, inner hind claw of ♀; 16, outer hind claw of ♀; 17, detail of nervulus. 9: scale-line; 10, 12, 17:2.0 × scale-line; 11, 13—16: 5.0 × scale-line.



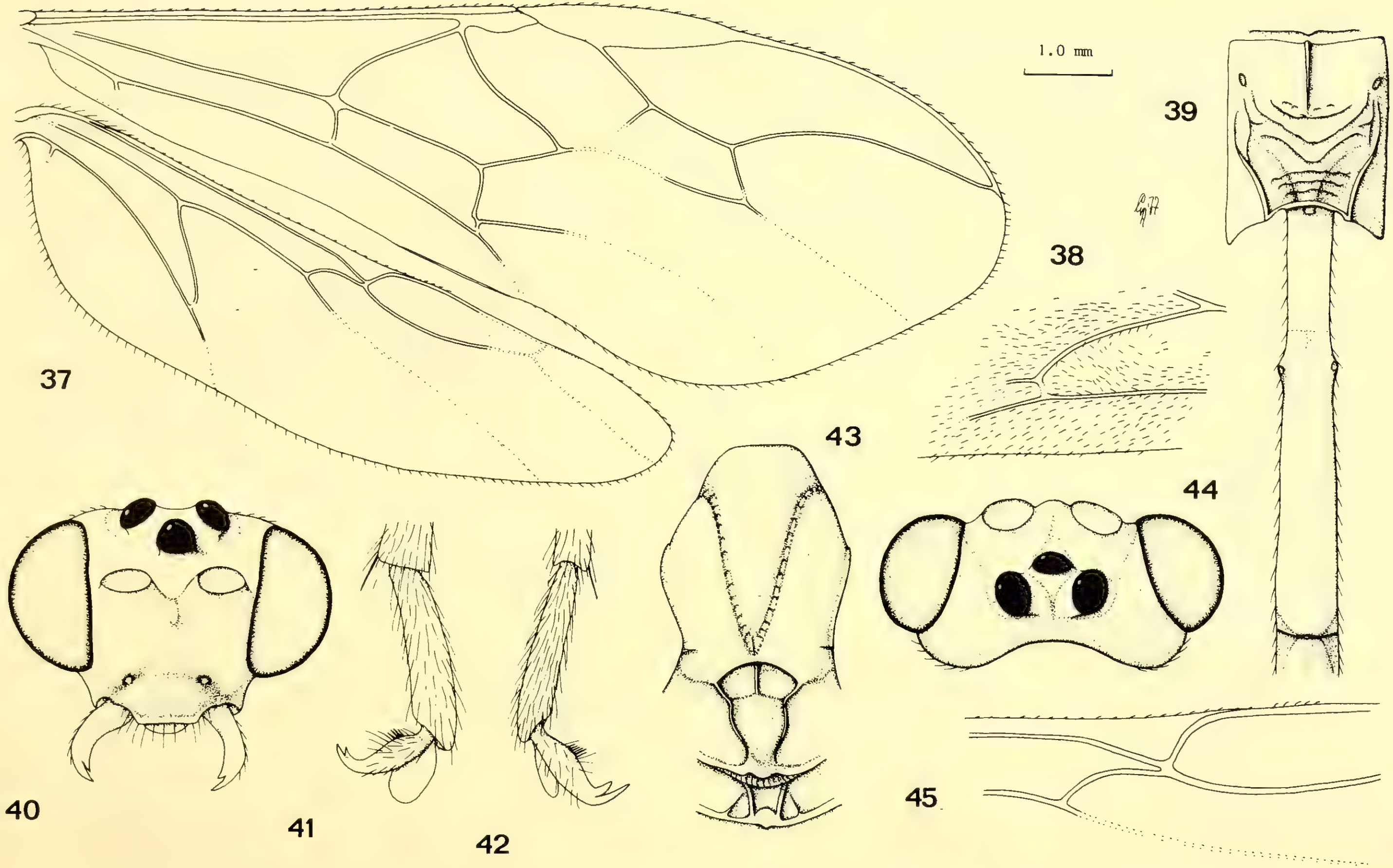
Figs. 18—24, *Xiphozele burmensis* Sharma, holotype. 18, habitus, lateral aspect; 19, 1st-3rd metasomal segments, dorsal aspect; 20, fore tibial spur, outer aspect; 21, id., inner aspect; 22, head, frontal aspect; 23, hind leg; 24, head, dorsal aspect. 18, 23: scale-line; 19, 22, 24: 2.0 × scale-line; 20, 21: 5.0 × scale-line.



Figs. 25—27, *Xiphozele burmensis* Sharma, holotype. 25, wings; 26, mesonotum, dorsal aspect; 27, detail of SM. 25: scale-line; 26, 27: 2.0 × scale-line.



Figs. 28—36, *Distilirella curvinervosa* gen. et spec. nov., holotype, but 36 of allotype. 28, habitus, lateral aspect; 29, antenna; 30, hind leg; 31, apex of hind tibia, outer aspect; 32, temple, latero-posterior aspect; 33 detail of nervulus; 34, inner fore claw; 35, outer hind claw; 36, apex of antenna of ♂ 28—30: scale-line; 31, 34—36: 5.0 × scale-line; 32, 33: 2.0 × scale-line.



Figs. 37—45, *Distilirella curvinervosa* gen. et spec. nov., holotype, but 38, 41 and 42 of allotype. 37, wings; 38, detail of nervellus; 39, propodeum and 1st metasomal tergite, dorsal aspect; 40, head, frontal aspect; 41, inner middle claw; 42, inner fore claw; 43, mesonotum, dorsal aspect; 44, head, dorsal aspect; 45, detail of basella and metacarpella. 37: scale-line; 38—40, 43—45: 2.0 × scale-line; 41, 42: 5.0 × scale-line.

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FORMICA INTEGRA (HYMENOPTERA: FORMICIDAE) IV. EXCHANGE OF FOOD AND TRICHOME SECRETIONS BETWEEN WORKER ANTS AND THE INQUILINE BEETLE, *CREMASTOCHEILUS CASTANEUS* (COLEOPTERA: SCARABAEIDAE)

by

W. J. KLOFT[1], R. E. WOODRUFF[2] and E. S. KLOFT[1]

With 20 figures

Abstract

Experimental evidence, using radioactive tracers, confirms the role of *Cremastocheilus castaneus* as a predator in the ant nests, as well as proves the existence of trichomes on the beetle which supply substances transmitted by ants through the social organization of the nest. A specific new ventral trichome area was discovered on the beetle, using this technique. The trichome areas are illustrated with scanning electron microscope photographs.

To conduct studies on biology, morphology, and foraging behavior of an ant, *Formica integra* Nylander, we transferred two nests of this forest ant from its natural habitat in Georgia (for description of locality, see Kloft et al., 1973) to the Forest Insect Research Laboratory, University of Florida, Gainesville, Florida in 1972. This ant, of the subfamily Formicinae, is the southernmost representative of the *Formica rufa* group in eastern United States. The studies about the possibilities of an introduction of this ant into Florida forests could be continued; two more papers are cited (Wilkinson et al., 1978, 1979, in press).

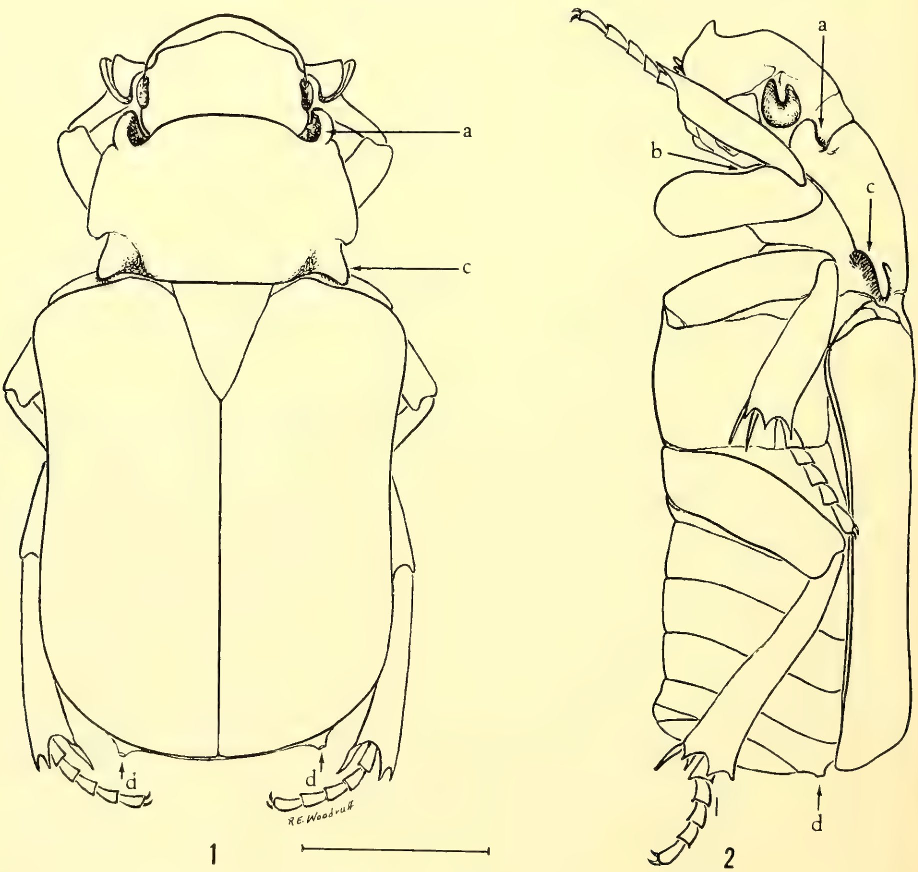
During our laboratory experiments, three specimens of a scarab beetle, *Cremastocheilus castaneus* Knoch, flew from the nests established in open arenas in a fully climatized laboratory (14 hrs light, 25 ± 2° C, 50—80% rel. air humidity). Possibly the change in environmental conditions between the natural colony and the laboratory induced emigration of the beetles.

The genus *Cremastocheilus* Knoch has long been in need of revision. The most recent general paper is that of Potts (1945), which provides a key to North American species. Because of the numerous short scattered setae on the pronotum and the geographic distribution, our specimens would key to *C. castaneus brevisetosus* Casey. Potts (1945: 74) stated: "Casey describes

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brevisetosus from a specimen he records from Iowa. However, the only specimens before me which agree are from Alabama, and I am led to suspect an erroneous label on the Casey specimen. In the Alabama specimens the setae of the pronotum are exceedingly broad and short and as the specimens are quite fresh, the character is presumably a good one. This appears to me to be the most distinctive race of any I have seen, and if this name is applicable to the southern specimens it apparently represents a valid subspecies. The value of the other two names as weak races of *castaneae* seems questionable to me. A long series from the Rocky Mountains is not easily separable, although in the main, they most closely agree with Casey's *pocularis*."



Figs. 1—2. Outline drawings of *Cremastocheilus castaneus brevisetosus*: 1) dorsal view; 2) lateral view: a) anterior pronotal trichome area; b) location of prosternal apophysis with trichomes; c) posterior pronotal trichome area; d) propygidial spiracle. (Scale line equals 2.5 mm).

The genus *Cremastocheilus*, which comprises more than 40 species, is endemic to North America. All known species live as adults in the nests of ants of 11 genera; *C. castaneus* has been recorded in association with *Formica* and *Polyergus* (Cazier & Statham, 1962). Wheeler (1910, 1928) reported it from *F. integra* nests. The first

monographic revision was given by Horn (1879); Casey (1915) described many novelties and revised the North American Cremastocheilini together with other groups of Cetoniinae. The species-level review by Potts (1945) has already been mentioned. Howden (1971) and Krikken (1976), proposing new genera, presented keys to the Western Hemisphere genera of Cremastocheilini.

Cazier & Statham (1962) pointed out that the true relationship between species of the genus *Cremastocheilus* and their host ants is not yet known. In observations of a western species (*C. stathamae* Cazier) in nests of the honey-ant, *Myrmecocystus mexicanus* Wesmael, Cazier & Mortenson (1965) found these beetles were obligate predators of the ant larvae. At the time this was the first recorded case of primarily predatory behavior within the family Scarabaeidae. W. M. Wheeler (1910) described the trichomes on the anterior and posterior prothoracic angles of the beetles and presented a figure of a *Formica integra* worker gnawing on one of the trichomes (see also this figure reproduced in Wilson (1971, fig. 20—4)). Alpert & Ritcher (1975) stated that *C. armatus* Walker adults were predaceous on both ant larvae and pupae, and that "Beetles were not disrupted from feeding even when covered with attacking ants."

Some of the observations of Cazier & Mortenson (1965) appeared very contradictory to them. As Wilson reported (1971: 390) the ants treated the beetles sometimes as synechtrans and sometimes as symphiles. Most of the time, however, they had the status of synoeketes; i.e., they were ignored and allowed to wander through the nest without interference.

Tracer studies on exchange of food and trichome secretions between ants and beetles

As shown by Goesswald & Kloft (1958, 1960, 1963) radioisotopes are a useful tool to elucidate interrelations within societies of social insects. Hoelldobler (1967, 1970) used ^{32}P to demonstrate the physiology of guest-host relations (myrmecophily) in ants. We used radioactive food (20% sucrose solution + $Na_2H^{32}PO_4$, specific activity 0.5 mCi/ml) to trace social food exchange in worker groups of *Formica integra*. All experiments were conducted in 1972, with dates shown.

EXPERIMENT I

7.vi: Worker ants were fed with ^{32}P honey and after 18 hrs checked under an end-window G. M. tube. The detector was connected with a Berthold-Frieseke Scaler-Timer System BF 22/25. Before checking, the insects were carefully decontaminated with a "chaser" solution plus detergent (Kloft, 1977). The ants had an average radioactivity of 20,000 CPM.

20.vi: At 12:00 noon one beetle (A) was put together with 10 radioactive-fed ants of *F. integra*; no food was added. At 3:45 PM the beetle was activity besieged by the ants which palpated it intensively with their antennae. Ants were sitting on and underneath the beetle's head, gnawing on the trichomes. Since we supposed food transfer from the ants to the beetle, we checked the beetle at 3:50 PM for radioactivity. The geometry was like that used for the measurements of the ants.

Result: After 3 hrs 50 min the beetle showed 3033 CPM. We checked at 5:30 PM and the activity was 3124 CPM or about the same. All ants were in good condition.

21.vi: At 9: 00 AM the beetle was in good condition, but all ants were dead, the gaster squeezed out. In some cases we found parts of the dead ants, presumably dismembered by the beetle.

EXPERIMENT II

22.vi: One beetle (B) was put with 10 radioactive-fed ants. The beetle displayed a death feint (Totstell-Verhalten), but was palpated by the ants. The palpation itself did not lead to contamination, as shown by subsequent checkings.

23.vi: After 22 hrs the beetle showed a total activity of 1600 CPM, and all 10 ants were in good condition. Presumably the beetle must have participated in the social distribution of radioactive-labelled food. Four hours later, after a total time of 26 hrs, the beetle had about the same rate of counts. However, 2 ants were found dead, and one of these appeared to be lacerated by the beetle.

In both experiments the ants were not only attracted to the trichomes on the anterior and posterior prothoracic angle of the beetles, but also soliciting, by antennal movements, certain parts of the sternum. These observations led to the detection, for the first time, of ventral hair tufts (trichomes) on the prosternal apophysis, described in the following part. As best we could observe, the beetle lowered the anterior portion of the mentum, which completely covers the mouth parts. The palpi could be seen moving in and out. We believe that by such movements the regurgitation by the ant is released. The food transfer could not be observed directly, but was evident by the increase of the beetle's radioactivity long before any ants were killed or squeezed out.

EXPERIMENT III

22.vi: Beetle (A) was carefully decontaminated and subsequently checked for radioactivity. At 11: 45 AM it had 20.810 CPM. Certain inherent problems are encountered in radio-isotope work. High counts are found when the radioactivity is broadly distributed. When the radioactivity is localized, lower counts result, even if the absolute radioactivity is the same. Equal distribution of the ^{32}P,

Table 1. Transfer of radioactivity from a radioactive labelled *Cremastocheilus castaneus* to worker ants of *F. integra* via the trichome secretions within 3 hrs.

	COUNTS	COUNTING DURATION (MIN)	CPM	± SQ. RT. / MIN
BACKGROUND	61	5	12.2	± 3.49
BACKGROUND	43	5	8.6	± 2.93
ANT A	155	5	31	± 5.56
ANT B	121	5	24.2	± 4.92

throughout the hemolymph, is probably responsible for this high count, although body absorption could have affected the counts (Kloft, 1962). This complete distribution within the body was a precondition for the following experiment: the radioactive-labelled beetle (A) was put together with 10 nonradioactive worker ants. The object was to determine if there were transfer of radioactivity, via trichome secretions, from the beetle to the ants.

22.vi: The ants had been around the trichomes gnawing on the hair tufts. At 2: 45 PM, after a total elapsed time of 3 hrs, the ants were checked for radioactivity (table 1). The ants definitely gathered radioactivity from the beetle, undoubtedly derived from trichome secretions. The next question was whether these radioactive-labelled secretions could be spread to other ants by social food distribution. To determine this, the ant (A) was enclosed for 20 hrs in a small container (surface 1.5 cm²) with 2 ants of the same colony. During this time no food was added. The results are shown in table 2. The donor ant, which was in direct contact with the radioactive beetle, dispersed radioactive material by social food distribution. The reason that the sum of counts of the donor ant (plus acceptor ants) is higher than the original rate of the donor ant is a result of the technical problem discussed earlier (Kloft, 1962).

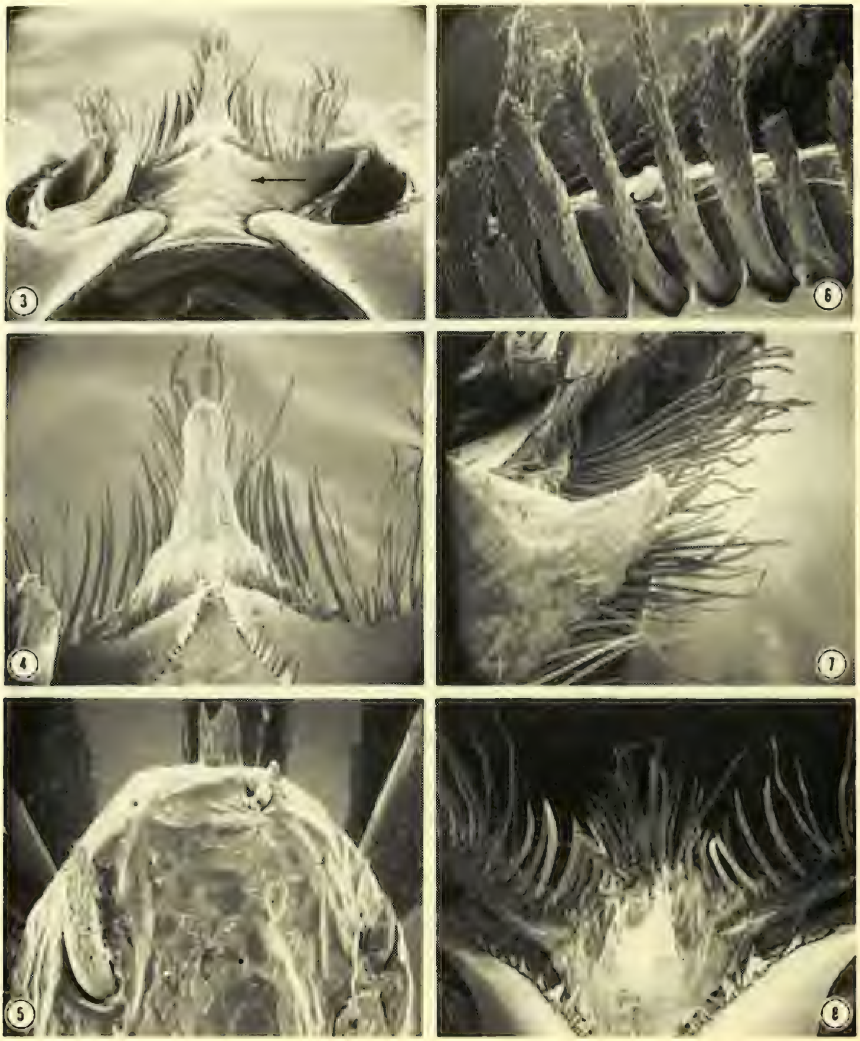
Table 2. Transfer of radioactivity, gathered from a radioactive *Cremastocheilus castaneus* (table 1) to further ants via regurgitation within 3 hrs.

	COUNTS	COUNTING DURATION (MIN)	CPM	± SQ. RT. / MIN
BACKGROUND	56	5	11.2	± 3.34
BACKGROUND	48	5	9.6	± 3.09
DONOR ANT = ANT A FROM TABLE I	97	5	19.4	± 4.40
1. ACCEPTOR ANT	81	5	16.2	± 4.02
2. ACCEPTOR ANT	61	5	12.2	± 3.49

Detection of further trichome areas on the venter of *Cremastocheilus*

Ever since *Cremastocheilus* has been known to inhabit ant nests, there has been speculation about the glandular nature of several morphological structures. This has usually centered around the large tufts of coarse setae (trichomes) located on the anterior (figs. 1a, 2a) and posterior (figs. 1c, 2c) angles of the pronotum (Hoelldobler, 1971). Other areas that have been previously suggested include the enlarged and projecting propygidial spiracles (figs. 1d, 2d), although there is no evidence for it.

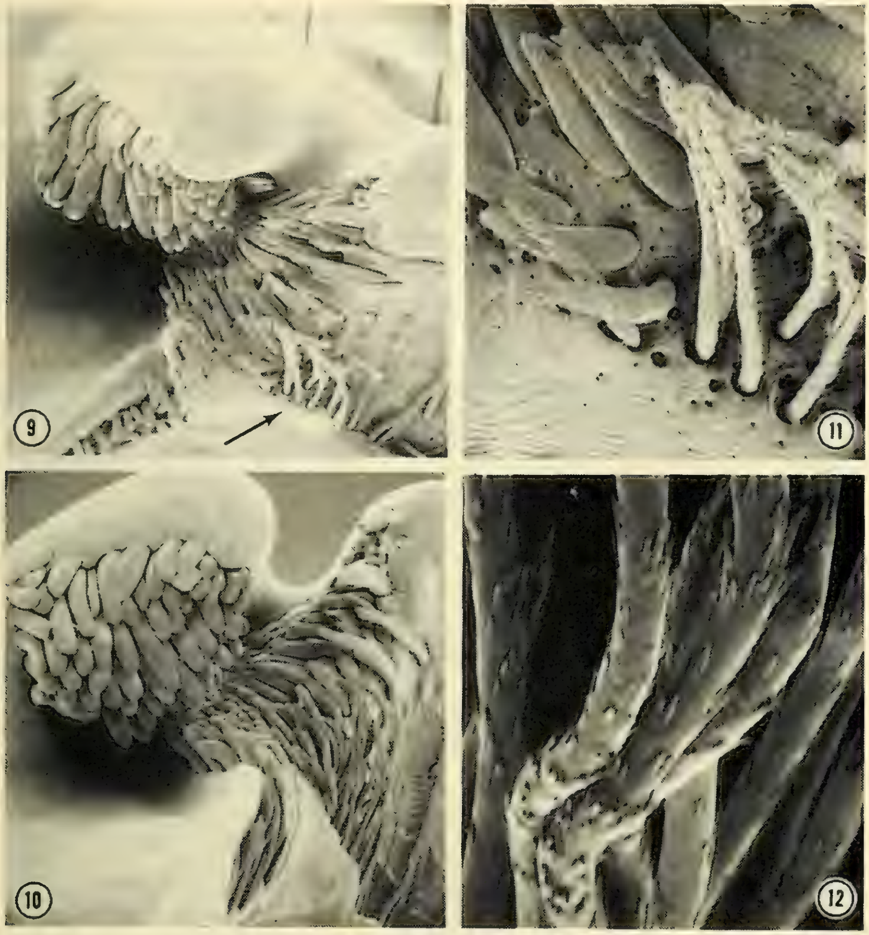
It was therefore quite surprising when the structure located between the anterior coxae (fig. 2b) was noted as attractive to the ants during this study. This



Figs. 3—8. Prosternal apophysis of *C. castaneus brevisetosus* (anterior legs removed). 3) postero-ventral view (45 ×); 4) enlargement of fig. 3 (95 ×); 5) enlarged tip of apophysis (925 ×); 6) sensors on margin behind apophysis, enlargement of area at arrow in fig. 3 (750 ×); 7) lateral view of apophysis (100 ×); 8) ventral or head on view of apophysis (100 ×).

structure (figs. 3—8) has been termed a prosternal apophysis by Krikken (1976). It projects forward toward the notch in the posterior margin of the mentum (fig. 19) and would appear to fit there if the head or mentum were extended down or back. The apophysis is fringed with very long sensors (figs. 3—5, 7—8) which appear to be the trichomes sought by the ants.

During removal of the legs in preparation for the scanning electron microscope studies, an additional group of sensors was located beneath the anterior coxae (figs. 3 arrow, 6). Although previously undetected and well-hidden, the compli-



Figs. 9—12. Anterior pronotal trichome area (fig. 1a) of *C. castaneus brevisetosus*: 9) dorsal view of right side (120×), area at arrow enlarged in fig. 11; 10) ditto, angle more dorsal (150×); 11) enlargement of trichomes at arrow in fig. 9 (525×); 12) ditto (1000×).

cated nature of the sensors (fig. 6) suggests that they serve an important function.

Unfortunately the exact behavior of the ant solicitations and the beetle's feeding are nearly impossible to observe carefully. Alpert & Ritcher (1975: 289) stated that "when feeding, a beetle lowered its mentum and pierced an ant larva with its sharp maxillae. The mandibles are greatly reduced and aid in the transport of fluid".

The prominent propygidial spiracles (figs. 1d, 2d) are a possible source of secretions because of their elevated nature and the shape and size of the opening (figs. 17, 18, 20). It is possible that attractant chemicals are produced, although chemicals with a totally different function could be involved. Repellents would certainly be advantageous to a commensal if the host ants became inhospitable and agressive. Alpert & Ritcher (1975: 288) found that "If the beetle was violently disturbed or turned over by the ants, a droplet of viscous fluid was released from

the anal opening. This fluid had an offensive odor and was effective in repelling the ants". They did not mention any observations on the nature of the propygidial spiracles.

The pronotal trichomes are so prominent, and unique to the tribe Cremastocheilini, that their role cannot be overemphasized. The sensors, or individual trichomes, appear to be gnawed upon by the ants (figs. 15—16). Only then is it noticeable that they are hollow (fig. 16). The several shapes of trichomes nearly fill the depressions surrounding them (figs. 1a, 1c, 2a, 2c, 10, 14). The anterior ones (fig. 1a) are accessible to the ants from above; the posterior ones (fig. 1c) primarily accessible from the side; and those on the prosternal apophysis are accessibly only ventrally.



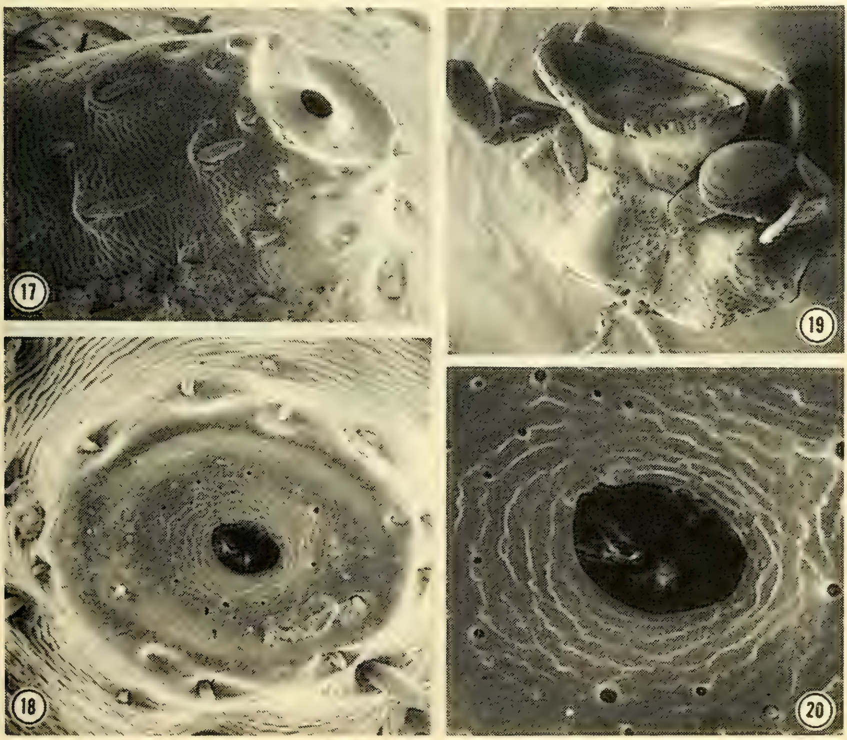
Figs. 13—16. Posterior pronotal trichome area (fig. 1c) of *C. castaneus brevisetosus*: 13) ventral view of left side (55 ×); 14) ditto (105 ×); 15) gnawed trichomes (535 ×); 16) ditto, individual hollow seta of the trichome (1050 ×).

DISCUSSION

According to our results, *Cremastocheilus castaneus* seems to play a double role within the *Formica integra* community. It is first a predator which kills ants, squeezes out juices, and feeds on the contents of the gasters of workers. It also cuts the ants into pieces, possibly feeding on these parts. Since we experimented only with adult workers we couldn't observe feeding on ant larvae, as described in

detail by Cazier & Mortenson (1965) and Alpert & Ritcher (1975). But in spite of being well protected in the sensitive mouth area by the anterior portion of the mentum, which completely covers the mouthparts (fig. 19), the beetles should not simply be regarded as synechtrans. They are, according to Wilson (1971), symphiles (so-called "true" guests). We determined that they are not only groomed but also participated in the social food exchange within the ant colony. The additional trichome areas on the prosternal apophysis help in releasing the food sharing behavior through the ants.

We obtained evidence of the transfer of radioactive material from the beetle to the ants, presumably via trichome secretions. As we expected, an ant which was in contact with a radioactive beetle also distributed the radioactivity, through social food distribution, to other ants which were never in contact with the radioactive-labelled beetles. Thus the "peace-making" allomones (Pasteels, 1977) of the beetle might be distributed to wider parts of the nest population. Possibly during the reproductive activities of the beetles, the production of the attractive and "peacemaking" secretions stop (or may be masked by sex pheromones which are a deterrent for the ants). This would explain the observations of Cazier & Statham (1962) that the beetles are pulled out of the nest and dumped in the refuse zone. In



Figs. 17—20. *Cremastocheilus castaneus brevisetosus*: 17) propygidial spiracle, lateral view (210×); 18) ditto, head on view (340×); 19) head, latero-ventral view (26×); 20) enlargement of propygidial spiracular opening of fig. 18 (850×).

the transitional stage, other workers of the same colony might attempt to pull the beetle back in the direction of the nest. This dumping and pulling back lasts a certain time, but finally the beetles fly away. Hoelldobler (1971) showed that myrmecophiles communicate in the same chemical language as their hosts. He defined trichomes as "... tufts of hairs that serve to increase the ability of well-integrated ant guests to communicate chemically. They are located on the ventral surface of highly modified anterior and posterior pronotal projections of *Cremastocheilus* adults". Mating and breeding areas are not yet known, but mating outside the colonies would be advantageous for gene flow.

ACKNOWLEDGMENTS

We thank the following persons for their valuable assistance: Thelma Carlysle (for the excellent SEM photos); Dr. J. Krikken (for reading the manuscript); Dr. R. C. Wilkinson (for colony maintenance and other favours); and the Dept. of Entomology, University of Florida (for travel funds and facilities for the senior author).

BIBLIOGRAPHY

Alpert, G. D., & P. O. Ritcher, 1975. Notes on the lifecycle and myrmecophilous adaptations of *Cremastocheilus armatus* (Coleoptera: Scarabaeidae). — Psyche 82 (3—4): 283—291; 5 figs.

Casey, T. L., 1915. A review of the American species of Rutelinae, Dynastinae, and Cetoniinae. — Mem. Coleoptera 6: 1—394.

Cazier, M. A., & M. Statham, 1962. The behaviour and habits of the myrmecophilous scarab, *Cremastocheilus stathamae* Cazier, with notes on other species (Coleoptera: Scarabaeidae). — J. New York Ent. Soc. 70: 125—149.

Cazier, M. A., & M. A. Mortenson, 1965. Bionomical observations on myrmecophilous beetles of the genus *Cremastocheilus* (Coleoptera: Scarabaeidae). — J. Kansas Ent. Soc. 38: 19—44.

Goesswald, K., & W. Kloft, 1958. Radioaktive Isotope zur Erforschung des Staatenlebens der Insekten. — Umschau 58: 743—745.

Goesswald, K., & W. Kloft, 1960. Neue Untersuchungen ueber die sozialen Wechselbeziehungen im Ameisenvolk, durchgefuehrt mit Radioisotopen. — Zool. Beitr. N. F., 5: 519—559.

Goesswald, K., & W. Kloft, 1963. Tracer experiments on food exchange in ants and termites. In: Radiation and radioisotopes applied to insects of agricultural importance, p. 25—42. — Int. Atomic Energy Agency, Vienna.

Hoelldobler, B., 1967. Zur Physiologie der Gast-Wirt-Beziehungen (Myrmecophilie) bei Ameisen. I. Das Gastverhältnis der *Atemeles*- und *Lomechusa*-Arten (Coleoptera: Staphylinidae) zu *Formica* (Hym., Formicidae). — Z. Vergl. Physiol. 56: 1—21.

Hoelldobler, B., 1970. Die Physiologie der Gast-Wirt-Beziehungen (Myrmecophilie) bei Ameisen. II. Das Gastverhältnis des imaginalen *Atemeles publicollis* Bris. (Coleoptera: Staphylinidae) zu *Formica* und *Myrmica* (Hym., Formicidae). — Z. vergl. Physiol. 66: 215—250.

Hoelldobler, B., 1971. Communication between ants and their guests. — Scientific Amer., Mar., 1971: 86—91.

Horn, G. H., 1879. A monographic revision of the species of *Cremastochilus* of the United States. — Proc. Amer. Philos. Soc. 18 (104): 382—397; pl. 4.

Howden, H. F., 1971. Key to the New World Cremastocheilini, with notes and description of a new genus. — Proc. Ent. Soc. Washington 73 (2): 224—230.

Kloft, W., 1962. Technical problems of radioisotope measurement in insect metabolism. In: Symposium (Bombay, 1960) "Radioisotopes and radiation in entomology", p. 163—172. — Int. Atomic Energy Agency, Vienna.

Kloft, W. J., R. C. Wilkinson, W. H. Whitcomb, and E. S. Kloft, 1973. *Formica integra* I. Habitat, nest construction, polygyny and biometry. — Florida Ent. 56 (2): 67—76.

Kloft, W. J., 1977. Part V. Applied part. In: Laboratory manual on use of radioisotopes in entomology, 2nd ed., p. 141—220. — Int. Atomic Energy Agency, Vienna.

Krikken, J., 1976. New genera of New World Cremastocheilini, with revisional notes (Coleoptera: Cetoniidae). — Zool. Meded. 49 (25): 307—315; 16 figs.

Pasteels, J. M., 1977. Evolutionary aspects in chemical ecology and chemical communication. — Proc. Int. Congr. Ent. 15: 281—293.

Potts, R. W. L., 1945. A key to the species of Cremastocheilini of North America and Mexico (Coleoptera, Scarabaeidae). — Bull. Brooklyn Ent. Soc. 40 (3): 72—78.

Wheeler, W. M., 1908. Studies on myrmecophiles. I. *Cremastocheilus*. — J. New York Ent. Soc. 16: 68—79.

Wheeler, W. M., 1910. Ants: their structure, development and behaviour. Columbia Univ. Press, New York: xxv + 663 p.

Wheeler, W. M., 1928. The social insects: their origin and evolution: xviii + 378 p. — Kegan Paul Trench, Trubner & Co., Ltd., London.

Wilkinson, R. C., A. P. Bhatkar, W. J. Kloft, W. H. Whitcomb, and E. S. Kloft, 1978. *Formica integra* II. Feeding, trophallaxis, and interspecific confrontation behavior. — Florida Ent. 61 (3): 179—187.

Wilkinson, R. C., A. P. Bhatkar, W. H. Whitcomb and W. J. Kloft, 1979. *Formica integra* III. Trial introduction into Florida. — Florida Ent. (In press).

Wilson, E. O., 1971. The insect societies: 1—548. — Belknap Press, Harvard Univ., Cambridge, Mass.

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A TAXONOMIC STUDY OF THE MICRO-LEPIDOPTERAN GENERA *MICROCALYPTRIS* BRAUN AND *FOMORIA* BEIRNE OCCURRING IN THE UNITED STATES OF AMERICA (LEPIDOPTERA, NEPTICULIDAE)

by

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With 26 text-figures

Abstract

The nearctic species of two genera of leaf-mining microlepidoptera are here revised as a prelude to a revision of the North American Nepticulidae. The concept of *Microcalyptris* Braun is widened from what was known as a monotypic genus to one having eight species.

Fomoria Beirne can no longer be regarded as solely Palaearctic for here the true relationship of two species is shown in their transfer from *"Nepticula"* von Heyden. Generic and species diagnoses, key, descriptions, and details of genitalia are given where necessary.

Introduction

In this revision eight species of *Microcalyptris* are discussed, of which two have been transferred from "*Nepticula*" von Heyden and five are new species, three of which are named and described here. Until last year *Microcalyptris* was known as a monotypic genus from a single specimen.

The genus *Fomoria* contains two species in North America and these, too, are transferred from "*Nepticula*" von Heyden and presented as new combinations here.

Abbreviations

L. A. Co. M.	Los Angeles County Museum of Natural History, California, USA.
USNM	United States National Museum of Natural History, Smithsonian Institution, Washington D. C., USA.
ANS	Academy of Natural Sciences, Philadelphia, USA.
MCZ	Museum of Comparative Zoology, Cambridge, Massachussets, USA.
CNC	Canadian National Collection, Ottawa, Canada.
FUA	Free University of Amsterdam, Netherlands.

The methods and abbreviations used are similar to those given in Wilkinson &

Scoble (1979: 2), except that the letters ANS are used to mean the Academy of Natural Sciences, Philadelphia, USA.

Scale lines on figs. are 0.1 mm unless stated otherwise.

Microcalyptris Braun, 1925

Microcalyptris Braun, 1925b: 224. Type species by monotypy: *Microcalyptris scirpi* Braun, 1925b: 225.

The genus shows one of the more simple patterns of venation found in the family Nepticulidae. Other features characteristic of the genus are the peculiar lateral arms associated with the vinculum and probably part of the gnathos; the very slender valves; and the juxta, which is extremely complex in some cases. The female genitalia often show complex sclerotisations of the ductus with the signa, usually, as linear rows of plates or single spiculate cells.

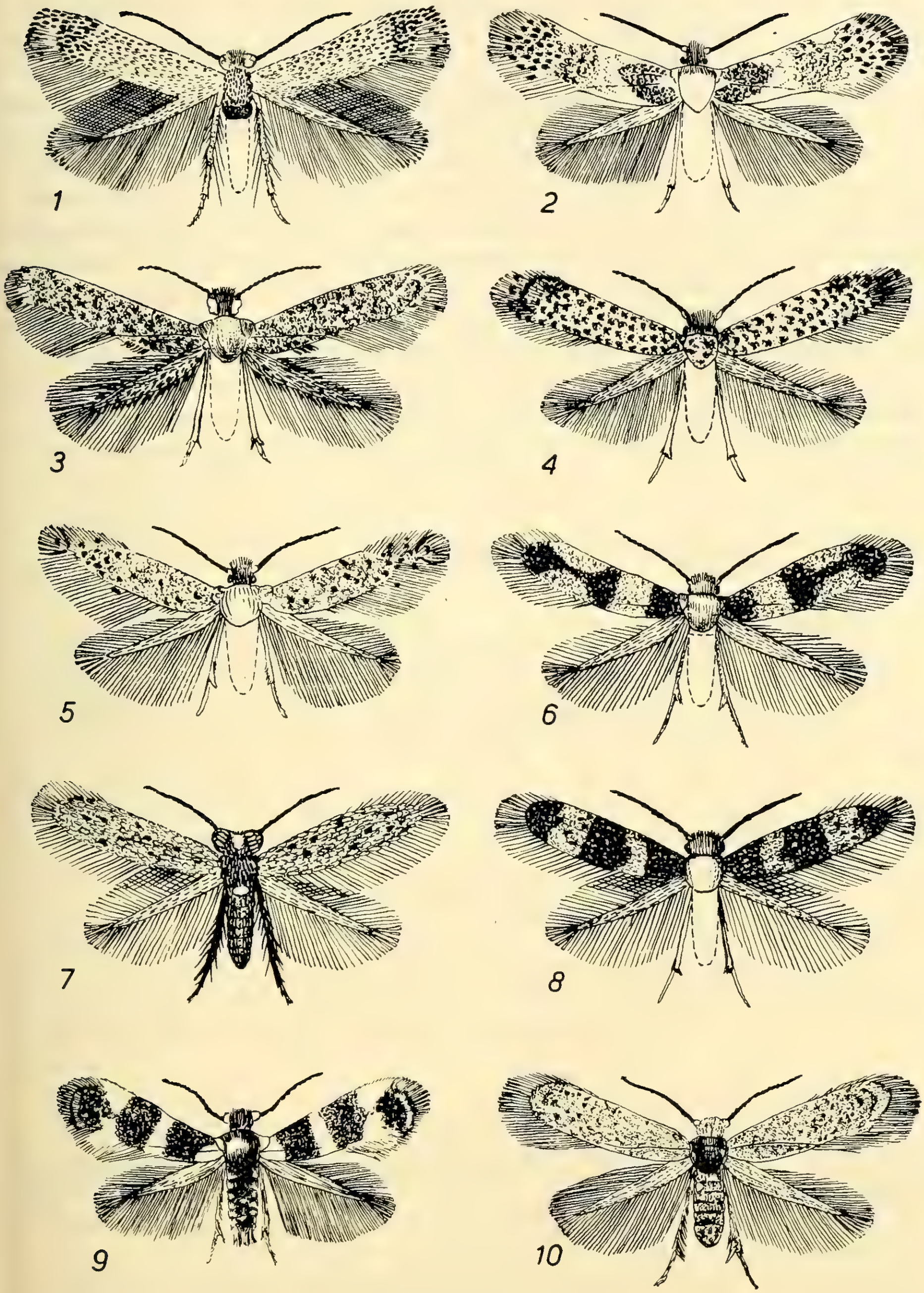
Taxonomic History

The genus was described from a single specimen collected by Braun in Utah (loc. cit.). Since that description there are no other published records of the genus until now, even though some new species are described here from Braun's material.

Braun's description of the venation of this genus is somewhat incomplete owing to the fact that she was reluctant to damage the single specimen available to her. However, Dr. D. Davis of the USNM and I have examined the specimen which confirms Braun's description in part but also shows that a vestige of the Cubitus is, in fact, present on the forewing. This is also confirmed by our work on other species. Braun was also unable to provide a description of the hindwing venation; this information is also provided in this revision.

Generic description

External features: ♂♀. Head: palps extending well beyond labrum, pale grey or white; antennae extending half the length of the forewing, fuscous; tuft on front of head usually ochreous, sometimes white or brown, vertex concolorous in most cases; eye-caps and collar ochreous, sometimes white or brown. Thorax pale white or buff and sometimes irrorate with brown. Abdomen usually concolorous with thorax, shining silver beneath. Venation as in fig. 11. Forewings: media coalescing with Radius at base and anastomosing as far as the middle of the wing; Cubitus vestigial; R_4 coincident with R_5; Anal vein not reaching the margin. Hindwings: Media single branched. Forewings: narrow and lanceolate, ground colour of dorsal surface grey or buff often with each scale brownish at the tip; fringe greyish, variously irrorate with wing scales apically; markings variable, usually with a single fascia or two patches. Hindwings: narrow and lanceolate, half width of forewings; usually grey and iridescent, sometimes with brightly coloured specialised scales on both surfaces concolorous, with similar patches on ventral surface of forewings. Legs: grey or brown, sometimes with scattered paler areas; proximal pair of spurs on hind-tibiae below the middle.



Figs. 1—10. External features. Fig. 1. *Microcalyptris scirpi*, male. Fig. 2. *M. thoracealbella*, male. Fig. 3. *M. postalatratus*, male. Fig. 4. *M. punctulata*, female. Fig. 5. *M. distaleus*, male. Fig. 6. *M. bipinnatellus*, female. Fig. 7. *M. bicornutus*, male. Fig. 8. *M. tenuijuxtus*, male. Fig. 9. *Fomoria pteliaeella*, male. Fig. 10. *F. hypericella*, male.

Male genitalia: vinculum always ring-shaped; tegumen fused with vinculum dorsally and produced into narrow, tapering pseuduncus sometimes weakly bilobed or bluntly rounded. Pseuduncus membraneous and uncus sclerotized in the form of a bridge usually with medial process spatulate, sometimes narrowly pointed or papillate. Gnathos with complex anterior and posterior projections and unique sclerotised lateral arms of vinculum in all species except possibly *distaleus* sp.n. Saccus usually markedly bilobed. Valves slender, usually bluntly rounded. Transtillae forming an inverted U-shape; transverse bars continuous. Juxta often complex and heavily sclerotised. Aedeagus usually long and slender with large spine-like cornuti and anellus.

Female genitalia: Posterior apophyses at least as long as the ductus, sometimes terminally sagittate. Colliculum usually funicular and weakly sclerotised. Ductus spiculate, usually with complex sclerotisations in the form of fin-like plates. Bursa copulatrix: large and irregularly pectinate; signum double, usually comprising linear rows of spinose cells or plates and, in a single case, ovate patches of reticulate cells.

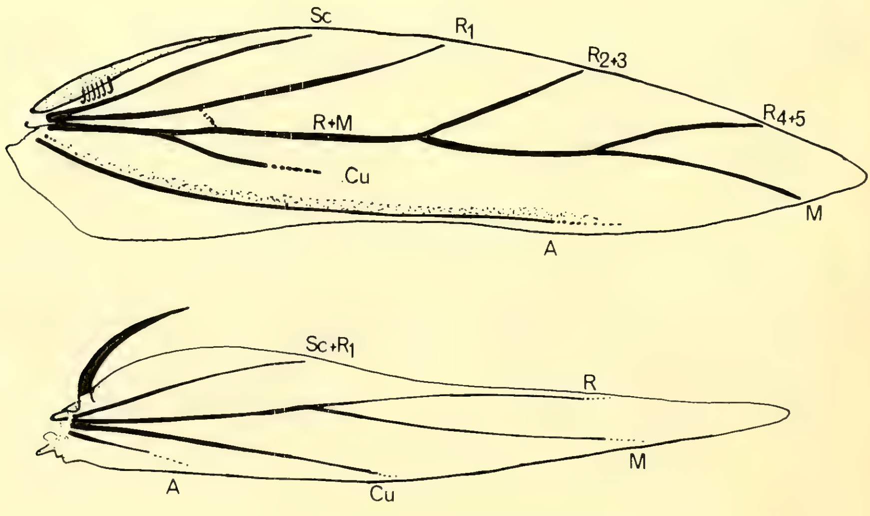


Fig. 11 *Microcalyptris* sp. Wing venation.

Generic differential diagnoses

Characters which differentiate North American genera of the family Nepticulidae are given.

Microcalyptris Braun, 1925.

Venation: reduced; Media of forewing coalescing with Radius from base and anastomosing to a point beyond the middle of the wing; R_4 coincident with R_5; Cubitus vestigial; Media of hindwing single, unbranched. Ground colour of dorsal surface of forewing usually pale and variously irrorate. Proximal pair of spurs on hind tibia below middle. Male genitalia, with membranous pseuduncus and

strongly sclerotised bridge-like uncus; sclerotised gnathos with complex anterior and posterior projections; lateral arms of vinculum usually with associated sclerotisations. Female genitalia with complex sclerotisations of the ductus; posterior apophyses very long, longer than the ductus; signa usually comprising linear row of spinose cells or plates. Larvae mining leaves.

Stigmella Schrank, 1802.

Venation: Media of forewing coalescing with Radius at base and anastomosing to a point beyond the middle of the wing; R_4 coincident with R_5; Cubitus arising separately, approaching middle of the wing; Media of hindwing single. Forewings usually uniform and dark in colour, with one or two complete fasciae or patches; fringe with diffuse margin. Proximal pair of spurs on hind-tibiae above the middle. Male genitalia usually with U-shaped vinculum; tegumen strap-like, articulating with vinculum dorsally; uncus bilobed; juxta, if present, membranous; aedeagus usually flask-shaped, vesica usually with many denticulate cornuti orientated in a ridge and rarely with platelike cornuti at the anellus. Female genitalia with simple ductus and accessory sac; bursa copulatrix usually without signum, but if present often single and weakly sclerotised. Larvae mining leaves of trees and shrubs and sometimes herbs.

Ectoedemia Busck, 1907.

Venation: Media of forewing coalescing with Cubitus at base, passing obliquely to Radius at or beyond R_{2+3} and anastomosing to a point beyond middle of wing; R_4 and R_5 separate; Cubitus usually approaching margin; media of hindwing single. Proximal pair of spurs on hind-tibiae sometimes in the middle. Male genitalia with gnathos W- or V-shaped, may vary according to method of mounting; vinculum ring-shaped and without associated lateral bars; tegumen extended into tapering or lobed pseuduncus; uncus absent or weakly membranous; valves inwardly curved distally sometimes with digitate setae; juxta absent; aedeagus regular in shape with elaborate cornuti and usually anellar spines. Female genitalia with or without complex sclerotisation of the ductus and spiculate accessory lobe; apophyses shorter than ductus; signa comprising patches of reticulate cells. Larvae may mine in, or form galls on leaves, petioles, bark or cortex.

Fomoria Beirne, 1945.

Venation: Media coalescing with Cubitus from base, both passing obliquely to Radius at R_{2+3} and anastomosing to beyond middle of wing; Cubitus becoming obsolete; R_4 and R_5 separate; Media of hindwing single, unbranched. Male genitalia with membranous pseuduncus and uncus as a spatulate sclerotisation; Y- or V-shaped gnathos; saccus weakly bilobed; valves sometimes with dorsal spine; aedeagus regular in shape and usually with complex anellar spines and cornuti. Female genitalia, colliculum with sclerotised funicular antrum or complex plates; simple ductus; signa comprising rather linear patches of reticulate cells. Larvae often recorded pupating within the leaf-mine.

Obrussa Braun, 1915.

Venation: Media of forewing coalescing with Cubitus at base, both passing obliquely to Radius at R_{2+3} and anastomosing to beyond middle of wing; Media and Cubitus separate terminally; R_4 and R_5 separate; Media of hindwing single. Ventral surface of forewing and dorsal surface of hindwing in males with patch of brightly coloured specialised scales. Proximal pair of tibial spurs below middle of hind-tibia. Male genitalia with ring-shaped vinculum; tegumen extended into tapering pseuduncus; convex saccus; valves blunted distally and each with large dorsal arm projecting transversely to reach opposite side of capsule; vesica with transverse plate expanded laterally. Female genitalia with plate-like sclerotisation at the colliculum; signa comprising ovate reticulate patches. Larvae only known to mine fruits of *Acer* spp.

Glaucolepis Braun, 1917.

Venation: Media of forewing coalescing with Cubitus at base, both passing obliquely to Radius at R_{2+3} and anastomosing to beyond middle of wing; Media and Cubitus separate terminally; R_4 and R_5 separate; Media of hindwing bifurcate. Hindwing of male with patch of brightly coloured specialised scales. Proximal pair of spurs on hind-tibiae in the middle. Male genitalia with tegumen extended into tapering pseuduncus; gnathos with large transverse arms and medial dorso-lateral arms fusing terminally; valves markedly bifurcate distally; aedeagus with lateral cornuti extending full length of vesica and digitate distally. Female genitalia with simple ductus; signa comprising linear patches of rows of pectinations. Larvae mining leaves.

Oligoneura Davis, 1978.[1])

Venation: greatly reduced; only two branches of Radius present; Media unbranched and arising from stem of R_{4+5}; Cubitus absent; hindwing extremely slender and Media unbranched. Forewing dark fuscous with a single, narrow, pale golden yellow fascia at distal third. Proximal pair of spurs on hind tibiae near apex. Male genitalia with uncus vestigial; gnathos well developed, complex, consisting of two, largely separate, transverse sclerites of a highly irregular, but symmetrical outline; vinculum broad, quadrate; aedeagus moderately short and stout, with a relatively complex apex and no cornuti. Female unknown. Presumably a leaf mining genus. The type-species mines *Coccoloba uvifera* (L.).

Artaversala Davis, 1978.

Venation: greatly reduced; Radius unbranched, terminating well short of apex; Media unbranched, extending almost to apex; Cubitus shortened, indistinctly present; hindwing extremely slender and Media unbranched. Forewings with a pale yellow to whitish apex and a single, broad, median fascia. Proximal pair of spurs on hind-tibiae near apex. Male genitalia with tegumen reduced to an

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[1]) The name *Oligoneura* is preoccupied by a Dipteran genus and must therefore be changed. In discussion with Dr. Davis it was decided to publish a replacement name in a subsequent volume of the Florida Entomologist.

extremely slender dorsal ring; uncus absent; vinculum well-developed and V-shaped; valves deeply divided and aedeagus relatively simple, without cornuti. Female genitalia with slender and elongate ductus; bursa copulatrix membranous; signa absent. Larvae mining leaves.

Checklist to the species of *Microcalyptris*

Microcalyptris Braun, 1925b.
scirpi Braun, 1925. Type species by monotypy.
thoracealbella (Chambers, 1873),
= *badiocapitella* (Chambers, 1876).
specimen 11.
punctulata (Braun, 1910).
specimen 12.
bipinnatellus sp.n.
postalatratus sp.n.
distaleus sp.n.
bicornutus Davis, 1978.
tenuijuxtus Davis, 1978.

Microcalyptris. Key to species. Males and females

1. Forewing with background predominantly dark; may have pale fascia or patches 2
— Forewing with background predominantly light, may have dark fascia or irrorations 5
2. Forewing dark without fascia or patches 3
— Forewing dark with pale fascia or patches 4
3. Male genitalia with H-shaped juxta, deeply bifurcate saccus and flattened pseuduncus . . . . *bicornutus* (p. 81)
— Male genitalia without H-shaped juxta, saccus only weakly bifurcate, pseuduncus convex terminally as in fig. 19 . . . . *postalatratus* (p. 77)
4. Forewing usually with 1 complete pale fascia and 1 broken in centre leaving 2 light patches. Pseuduncus of male bifurcate and uncus not extending beyond it, juxta mace-shaped with cornuti; 4th abdominal sternite with two patches of long setae; as in fig. 13c. Female genitalia with one long pair and one short pair of apophyses; signa less than 3 cells wide as in fig. 14 . . . . *thoracealbella* (p. 67)
— Forewing usually with 2 large pale fasciae and terminal spot. Pseuduncus of male convex and uncus extending beyond it, juxta not strongly developed; 4th abdominal sternite without patches of long setae; as in fig. 17. Female genitalia with two pairs of very long apophyses; signa more than 3 cells wide; as in fig. 18 . . . . *bipinnatellus* (p. 75)
5. Forewing pale with one broad dark brown terminal fascia. Male genitalia probably as in fig. 12, but see description . . . . *scirpi* (p. 66)
— Forewing pale without dark fasciae but may be irrorate 6

6. Male genitalia with well developed T-shaped (inverted) juxta; gnathos without central posterior process. Female genitalia without signa *tenuijuxtus* (p. 82)
— Male genitalia without well developed juxta; gnathos with central posterior process. Female genitalia with signa 7
7. Male genitalia with pointed valves; bifurcate pseuduncus; aedeagus without very large anellar spines; as in fig. 20. Female genitalia with simple row of cells in signa and unmodified ductus bursae as in fig. 21 . . . . *distaleus* (p. 78)
— Male genitalia with rounded valves; simple convex pseuduncus; aedeagus with very large annellar spines; as in fig. 16. See specimen 12. Female genitalia with complex signa and ductus bursae as in fig. 15 . . . . *punctulata* (p. 71)

Microcalyptris scirpi Braun
(figs. 1, 12)

Microcalyptris scirpi Braun, 1925b: 225 (Type species).
Microcalyptris scirpi Braun; McDunnough, 1939: 107 (no. 9790).

Description. External features: ♂ (fig. 1). Head: palps and antennae brownish buff; tuft on front of head and vertex light brown; eye-caps and collar brown. Thorax and abdomen shiny brown, probably light on living specimens. Forewings: ground colour of dorsal surface buff with gold reflections; terminally dark brown fascia extends onto fringe; fringe mainly buff, some dark brown at ends of fascia; ventral surface also buff but edged in dark brown all round and fringe greyish buff and in part dark brown. Hindwings: both surfaces and fringe greyish. Legs greyish buff with metallic reflections.

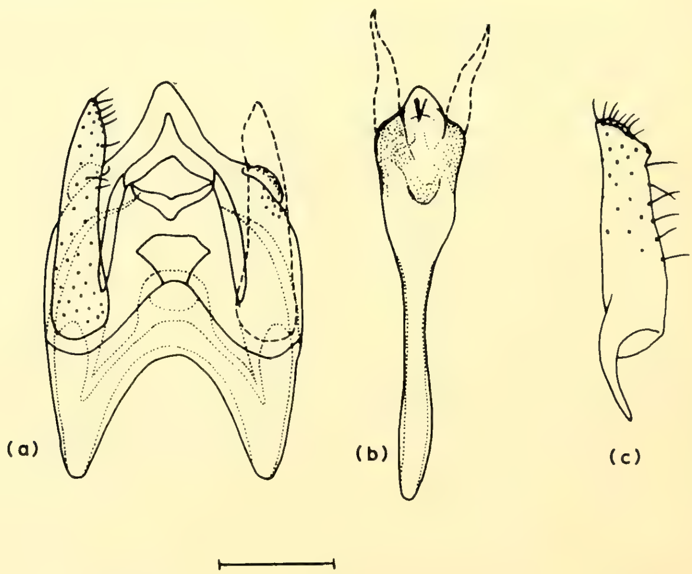


Fig. 12. *Microcalyptris scirpi*. Reconstructed male genitalia. a, genital capsule; b, aedeagus; c, valve.

Female not known.

Wing expanse [1]): Holotype 5 mm.

Genitalia: ♂ (fig. 12). Unfortunately this species is known only from a single specimen and the abdomen has been damaged. Thus the genitalia are badly broken and infused with some substance which does not dissolve in the usual solvents. The figure and description are therefore reconstructions. Pseuduncus: prolonged backwards, single and uncus in form of inverted Y. Gnathos: probably Y-shaped. A pair of slender lateral support rods present, extending from base of uncus to base of valves. Vinculum: lateral arms narrow, almost equal to length of valves. Saccus broad, deeply bifurcate. Valves not reaching beyond pseuduncus, tapered terminally. Transtillae: lateral arms narrow. Juxta appears to be a simple weakly sclerotised lobe but may have two posteriorly directed spines. Aedeagus probably as illustrated although specimen is in three pieces. There is, on the slide, a broken "horn" which is possibly one of a pair belonging to the aedeagus (dotted). However, this is not certain and they could be part of the juxta.

Female not known.

Host plant: *Scirpus paludosus*.

Mine: A lower surface ophionome.

Diagnosis. The buff colour of the forewings together with the single brown terminal fascia should be sufficient to diagnose this species from others known at present — see check list page 65. The posterior Y-shaped sclerotisation of the gnathos is also characteristic as may be other parts when the structure is known for certain.

Discussion. Braun (1925b) described this genus and species from a single specimen. The specimen is still the only one representing *scirpi* although it should not be too difficult to acquire fresh material. We have no knowledge of the female and since the one male specimen has damaged genitalia we also need to be better informed regarding the structure of the male.

Distribution. USA: Utah.

Material examined. ♂ Holotype: USA: "B1142; Bear R. Bay, Utah, i.22.vi.24. Type collection of Annette F. Braun; *Microcalyptris scirpi* Braun Type"; slide no: USNM 16785; in ANS.

Biology. Mine. Uniformly narrow tract, 8 cm, blackish. Not visible from upper surface.

Cocoon. Brownish ochreous, ovoid, very convex above, lacking projecting rim, presumably found in other Nepticulidae.

Microcalyptris thoracealbella (Chambers)
(figs. 2, 13, 14)

Nepticula thoracealbella Chambers, 1873: 127.

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[1]) The wing measurements represent the alar expanse in millimeters. The moths were measured from the middle of the mesothorax to the wing-tip and this figure was doubled to give the full alar expanse.

Nepticula thoracealbella Chambers; Chambers, in Hayden, 1878: 158.
Nepticula thoracealbella Chambers; Dyar, 1903: 547.
Nepticula thoracealbella Chambers; Braun, 1917: 189.
Nepticula thoracealbella Chambers; Braun in Forbes, 1923: 93.
Nepticula thoracealbella Chambers; McDunnough, 1939: 107 (no. 9763).
Microcalyptris thoracealbella (Chambers); Davis, 1978: 214.
Nepticula badiocapitella Chambers, 1876: 160 (syn. by Braun, 1917b: 189).
Nepticula badiocapitella Chambers; Chambers in Hayden, 1878: 157.
Nepticula badiocapitella Chambers; Dyar, 1903: 545.

Description. External features: ♂ (fig. 2). Head: palps creamy white; antennae pale greyish brown; tuft on front of head dark ochreous, vertex darker; eye-caps shining white; collar dark ochreous. Thorax whitish, weakly lustrous. Abdomen pale yellowish brown with metallic grey reflections on both surfaces. Forewings: ground colour of dorsal surface pale brown with bronze reflections, each scale

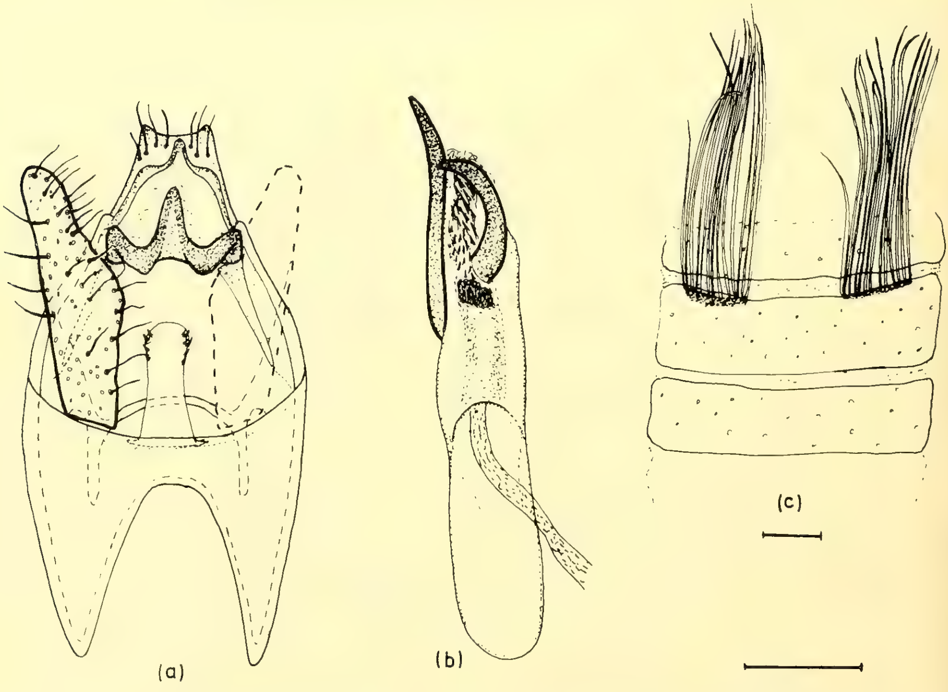


Fig. 13. *Microcalyptris thoracealbella*. Male genitalia. a, genital capsule; b, aedeagus; c, hair brushes on abdomen segment 4.

greyish at the base producing an irrorate effect which becomes more prominent distally; fringe variously irrorate with wing scales apically, whitish and iridescent silver; single medial fascia, off white, broadening on dorsal margin, followed by two marginal patches of the same colour, postmedial in position. Hindwings: ground colour and fringe pale greyish white, shining silver. Legs pale yellow-brown with scattered metallic grey reflections. A pair of hair brushes dorsally on segment IV, lateral in position as in fig. 13c.

Female. As ♂ except for a pair of convex external pockets ventrally on the third abdominal segment, medial in position. Hair brushes absent.

Wing expanse: ♂: 4.6—5.2 mm (4 specimens); ♀: 4.6—4.8 mm (2 specimens). Holotype: 4.8 mm.

Genitalia: ♂ (fig. 13). Pseuduncus extended, weakly bilobed posteriorly; uncus a bridge-like sclerotisation with a single medial process. Gnathos: as in fig. 13a; transverse ventral plate with a broad medial process; dorso-lateral arms broad and blunted terminally. Vinculum: lateral arms narrow with associated weakly sclerotised bars; ventral plate very narrow. Saccus broader than the ventral plate, markedly bilobed with each lobe twice as long as broad at the base. Valves not reaching beyond the pseuduncus, straight and blunted terminally. Transtillae: lateral arms short and narrow; ventral arms long and straight; transverse bars

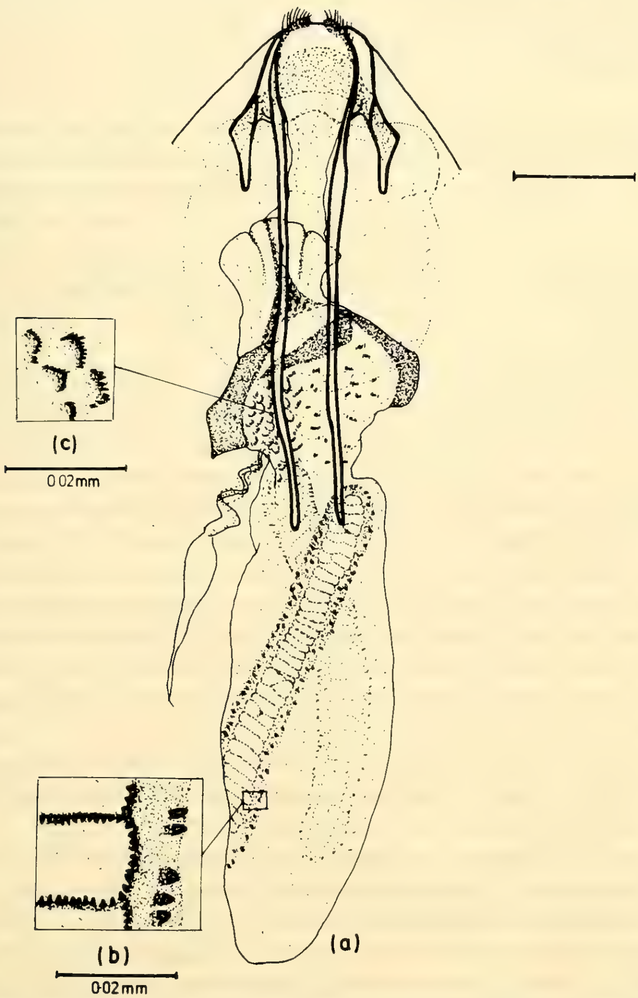


Fig. 14. *Microcalyptris thoracealbella.* Female genitalia. a, genitalia; b, detail of signum enlarged; c, detail of ductus bursa enlarged.

fused to form a continuous narrow strap. Juxta a flask-shaped spinose plate as in fig. 13a. Aedeagus: regular, equal to length of the capsule, with a medial orifice at the point of entry of the ductus ejaculatorius; vesica well defined, with cornuti as small denticles distally and with a cup-shaped plate of minute papillae; anellus comprising a pair of very large canine tooth-like spines.

Female (fig. 14). Colliculum funicular and weakly sclerotised. Ductus bursae short, expanding medially and bearing three fin-like plates as in fig. 14a. Accessory duct arising from area of dilation, spiral proximally. Bursa copulatrix: covered proximally with scallop-shaped chains of pectinations as in fig. 14c; signum double, comprising two equal length bands of spinose cells with a spinose margin as in figs. 14a and b. Anterior apophyses short and broad. Posterior apophyses narrow, approximately four times length of anteriores. Anal plate large and constricted medially as in fig. 14a.

Host plant: Not known.

Mine: Not known.

Diagnosis. Resembles *bipinnatellus* sp.n. in the pattern of wing markings, but the darker ground colour, smaller distal patches and the absence of the apical patch in *thoracealbella* separates the two. The male genitalia also resemble those of *bipinnatellus* sp.n. but are separated by the papillate pseuduncus, the single lobe of the juxta, and the shorter aedeagus relative to the capsule, in *thoracealbella*. The female genitalia most closely resemble those of *punctulata*: the scallop-shaped pectinations on the ductus and the form of the cells of the signa in *thoracealbella* distinguish the two.

Discussion. Originally described by Chambers (1873) from a single specimen captured in Kentucky. Chambers later (1876) described a similar species also from a single Kentucky specimen, under the name *badiocapitella*. Braun (1917) regarded these two as synonymous, stating that the descriptions were virtually identical and that the range of variation found in *thoracealbella* is sufficient to include *badiocapitella*. The material examined in this study, which is believed to represent *badiocapitella*, has been checked with the type of *thoracealbella*, and found to be similar. However there is no trace of the type of *badiocapitella* and this prevents a complete comparison. Chambers' description of *badiocapitella* could also be applied to *bipinnatellus* sp.n. especially in the form of the forewing markings, but in the interests of nomenclatorial stability *badiocapitella* is left in synonymy with *thoracealbella*.

There is a single ♀ from Arkansas, labelled specimen 10, which differs only in that the tuft on the vertex and the forewing ground colour are dark chocolate brown.

Distribution. USA: Kentucky, Pennsylvania, Ohio, Virginia, New York.

Material examined. ♂ Holotype: USA: "Kentucky Chambers; *thoracealbella*; Type 14952; labelled as *N. thoracealbella*, MCZ"; CNC slide no. 3513; in MCZ.

Other specimens: In USNM: Pennsylvania, Arendtsville; 1♀, 2.vii.1921, 2♂, 3 ex., 6.vii.1921 (Frost). Pennsylvania, Harrisburg; 1♂, 24.vi.1912. Virginia, Mountain Lake; 1♂, 23.vii.1940 (Milne and Milne). In ANS: Ohio, Cincinnati; 1♂, 17.vii.1903, 1♀, 1945, 1♀, 20.v.1945 (Braun). In L. A. Co. Museum: New York

Sea Cliff; 1♂ 20.v.? Specimen 10: In USNM: Arkansas, Devil's Den St. Pk., Washington County; 1♂, 1♀, 23.vi.1966 (Hodges); slide no. USNM 17298; wing expanse 5.2 mm.

Biology. Immature stages unknown.

Voltinism. Bivoltine with adults on the wing in May and in late June and July.

Specimen 11

There is a single male with externals like *thoracealbella* except that the tufts on the head are darker, the thorax and forewings are pale brown and the distal markings of the forewing are triangular streaks rather than patches. The genitalia are badly damaged but can be seen to differ from *thoracealbella* in the following: the juxta is valve-like in form with a weakly curved apical hook; the spines of the anellus are shorter than in *thoracealbella* and the cornuti comprise a transverse papillate plate which is expanded laterally as in *Obrussa* spp.

This specimen is labelled as reared from *Scirpus olneyi*. Specimen 11: In USNM: Maryland, Blackwater Refuge; from *Scirpus olneyi*; 1♂, 11.viii. 1943; slide no. USNM 16273; wing expanse 4.0 mm.

Microcalyptris punctulata (Braun) comb. n.
(figs. 4, 15)

Nepticula punctulata Braun, 1910: 174.
Nepticula punctulata Braun; Braun, 1917: 192.
Nepticula punctulata Braun; McDunnough, 1939: 107 (no. 9769).

Description. External features: ♂♀ (fig. 4). Head: palps whitish buff; antennae pale brown; tufts on front of head very pale buff, vertex usually brownish; eye-caps buff; collar buff. Thorax pale greyish buff, sometimes irrorate with brown. Abdomen brown, shining metallic grey beneath. Forewings: ground colour of dorsal surface greyish buff with scattered silver reflections, variously irrorate with scales brownish at the tip; fringe grey, shining silver. Hindwings: ground colour and fringe pale greyish buff. Legs grey-buff with scattered paler areas, shining, metallic grey behind.

Wing expanse: ♂: 5.0 mm (1 specimen); ♀: 4.8—6.0 mm (2 specimens). Lectotype: 4.8 mm.

Genitalia: ♂: not known (the abdomen is missing from the 1♂ specimen but see specimen 12). ♀ (fig. 15): Colliculum membranous. Ductus bursae long, covered with small denticles proximally and more elongate spicules distally, and with a medial expansion bearing three fin-like sclerotisations as in fig. 15a. Accessory duct arising from area of dilation, spiral distally. Bursa copulatrix: covered proximally with irregular chains of pectinations; signum double, comprising two equal linear bands of spinose plates as in figs. 15a and b. Anterior apophyses broad basally, with associated papillae as in figure. Posterior apophyses as long as ductus and straight.

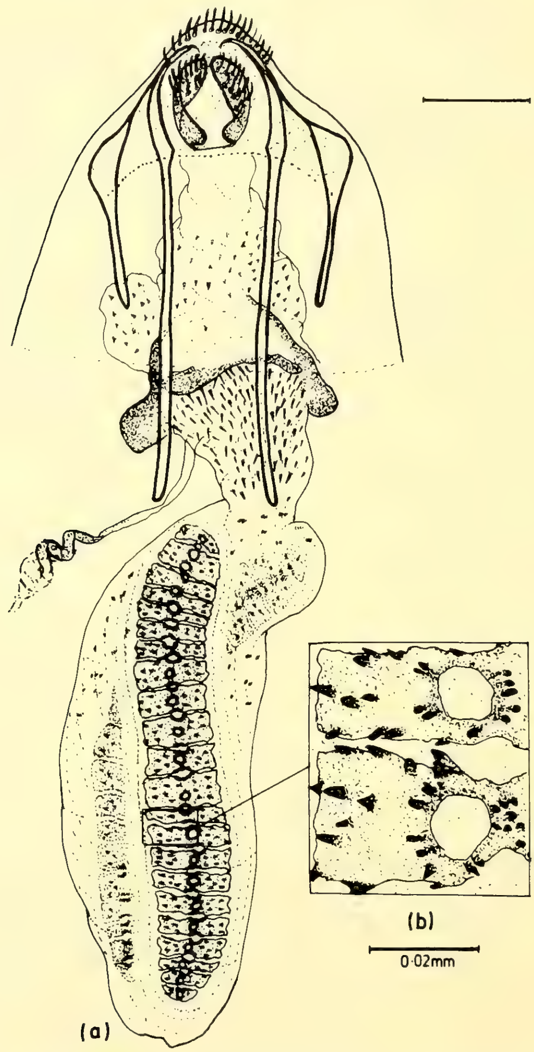


Fig. 15. *Microcalyptris punctulata*. Female genitalia. a, genitalia; b, enlarged detail of signum.

Host plant: *Ceanothus cuneatus* and *Rhamnus californica*.

Mine: an upper surface ophionome.

Diagnosis. Resembles *distaleus* sp.n. in externals but differs in the generally darker ground colour in *punctulata*; the absence of fasciae or patches on the forewing separates *punctulata* from *thoracealbella* and *bipinnatellus* sp.n. The female genitalia most closely resemble those of *thoracealbella*; the spicules of the ductus and the spinose plates of the signa in *punctulata* separate the two.

Discussion. A better evaluation of the affinities may be made when male genitalia are known. The female genitalia relate closely to *thoracealbella*, compare figs. 14 and 15. This species was originally described from two specimens bred

from *Ceanothus cuneatus* in California. They were labelled as cotypes by Braun. Both have been examined and are in extremely poor condition. They are unsuitable for reference to the externals, however, the specimen designated as lectotype is the one from which a genitalia slide has been prepared.

Distribution. USA: California.

Material examined. I designate as lectotype, a ♀ syntype; USA: "B.422; Dutch Flat, Placer Co., Cal. i. 22.ii.1909; Type Collection of Annette F. Braun; *Nepticula punctulata* Braun Cotype"; on *Ceanothus cuneatus*; slide No. USNM 16212; in ANS.

Paralectotype: In ANS: same data as lectotype, 1 ex.

Other specimens: In ANS: California, Loma Linda; 1♀, 3.vi.1912, 1♀, 8.iv., 1 ex., 18.vi.1912, 1♂, 25.vi.1912, (Pilate).

Mines examined: In ANS: California, Dutch Flat, Placer Co.; 2 mines on *Ceanothus cuneatus*; 6.i.1909, B.422 (Braun).

Biology. Egg. Laid on the lower surface of the leaf.

Host. Braun (1917) reports that the species also mines leaves of *Rhamnus californica* from Yosemite, although this material has not been traced.

Mine. A short linear mine not visible from the upper surface in the earlier stages later becomes quite distinct and usually follows the margin of the leaf. The frass is deposited as a central black line.

Larva. Emerges on the upper surface of the leaf.

Cocoon. Reddish brown in colour.

Voltinism. Trivoltine with adults on the wing in February, April and June. Braun (loc.cit.) records that the mines on *Rhamnus* were collected in July.

Specimen 12 (fig. 16)

There is a single male which may be conspecific with *punctulata*:

Description. External features: ♂. As *punctulata* except that: tufts on front of head and vertex creamy white; forewings dorsally lustrous white, each scale darker at the tip producing a slight irrorate effect; forewings ventrally covered with creamy white scales almost to the tip; hindwing dorsal and ventral surfaces covered with creamy white scales extending almost to the tip.

Genitalia: ♂ (fig. 16). Pseuduncus long, with a single blunted lobe and uncus with bridge-like sclerotisation and a broad, spatulate medial process. Gnathos: transverse ventral plate with a long thin medial process; dorso-lateral arms broad and blunted with short posteriorly-directed processes. Vinculum: lateral arms with associated weakly sclerotised bars tapering distally; ventral plate reduced. Saccus broad, markedly bilobed, each lobe as long as broad at the base. Valves not reaching the pseuduncus, broad and constricted medially, rounded terminally. Transtillae: lateral arms short and broad; ventral arms long and tapering; transverse bars indeterminate. Juxta with a broad boat-shaped base as in fig. 16a, distal portion indeterminate. Aedeagus: equal to length of capsule, broadening distally and with a medial orifice; vesica well defined with cornuti in form of several long denticles distally and a cup-shaped plate of minute papillae; anellus comprising a pair of very long tooth-like spines.

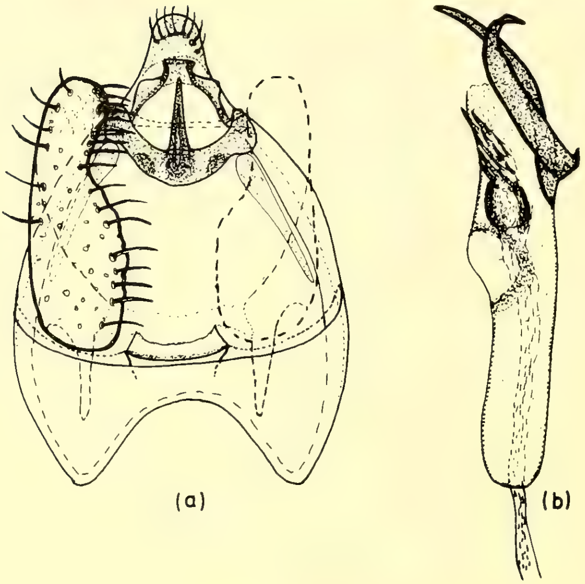


Fig. 16. *Microcalyptris* specimen 12. Male genitalia. a, genital capsule; b, aedeagus.

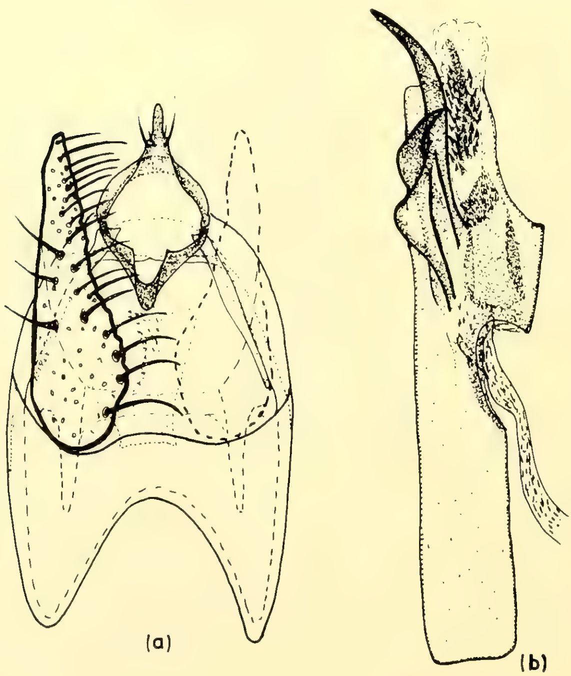


Fig. 17. *Microcalyptris bipinnatellus*. Male genitalia. a, genital capsule; b, aedeagus.

Diagnosis. Resembles *thoracealbella* in the overall form of the male genitalia but may be separated by the longer single lobe of the pseuduncus, the sharp medial process of the gnathos and the more weakly bilobed saccus, in specimen 12. The externals are generally more white than the females of *punctulata* and the absence of scattered brown scales on the forewings separates it from the males of *distaleus* sp.n.

Discussion. The similarity of this specimen to *punctulata* suggests that it may represent the male of that species. The genitalia are close to those of *thoracealbella*, a fact which correlates well with the relationship between the female genitalia of *punctulata* and *thoracealbella*.

Material examined. Specimen 12: USA: Arizona, Flagstaff; 1♂, 17.vii.1939 (Braun); wing expanse: 5.2 mm; slide no. 149—PJN; in ANS.

Microcalyptris bipinnatellus sp.n.
(figs. 6, 17, 18)

Description. External features: ♂. Head: palps greyish; antennae dark grey-brown; tuft on front of head ochreous, vertex paler; eye-caps off-white, weakly lustrous; collar sandy buff. Thorax sandy buff, irrorate with very pale brown. Abdomen brown-grey with metallic reflections above, shining silver beneath. Forewings: ground colour of dorsal surface very pale brown, each scale darker at the tip, scattered blue reflections; fringe greyish white, becoming creamy white at the apex; two creamy white fasciae, antemedial variable in width but usually broadening on the dorsal margin, postmedial oblique and broken by a line of brown scales centrally, followed by a creamy white apical patch, variable in extent. Hindwings: ground colour and fringe greyish, shining silver. Legs dark brown with paler areas, shining metallic grey behind.

Female (fig. 6). As ♂ except for a pair of convex, external pockets ventrally on the third abdominal segment.

Wing expanse: ♂: 4.6—5.6 mm (2 specimens); ♀: 5.0—6.4 mm (6 specimens). Holotype: 6.8 mm.

Genitalia: ♂ (fig. 17). Pseuduncus single lobed; uncus with bridge-like sclerotisation and a large medial process. Gnathos: as in fig. 17a; transverse ventral plate with large medial process; dorso-lateral arms narrow and tapering. Vinculum: lateral arms with associated weakly sclerotised bars, ventral plate reduced, with a convex medial expansion. Saccus broad, markedly bilobed with each lobe longer than broad at base. Valves not reaching the pseuduncus, narrow and tapering distally. Transtillae: lateral arms short and broad; ventral arms long and straight; transverse bars indeterminate. Juxta trifurcate with central lobe spinose. Aedeagus: longer than the capsule, broadening distally, basally quadrate with large medial orifice at the point of entry of the ductus ejaculatorius; vesica well defined with cornuti as small denticles distally and with a cup-shaped plate of minute papillae; anellus comprising a pair of very large hook-like spines.

Female (fig. 18). Colliculum with weakly sclerotised funicular antrum and a pair of fin-like plates. Ductus bursae long and weakly sclerotised, with a pair of fin-like

plates distally. Accessory duct arising distally. Bursa copulatrix: with weakly sclerotised chains of pectinations proximally; signum double, comprising two ovate cellular patches of equal size, as in figs. 18a and b. Anterior apophyses long and narrow. Posterior apophyses broad and sometimes club-shaped distally, reaching well beyond the anteriores. Anal plate ovate as in fig. 18a.

Host plant: Not known.

Mine: Not known.

Diagnosis. Similar to *thoracealbella* in externals but the paler ground colour, the larger distal patches and the presence of the apical patch on the forewings of *bipinnatellus* separate the two. The male genitalia also resemble those of *thoracealbella* but they may be differentiated by the single lobe of the pseuduncus, the tapering valves and the longer aedeagus relative to the capsule, in *bipinnatellus*. The female genitalia are differentiated from other members of the genus, listed on

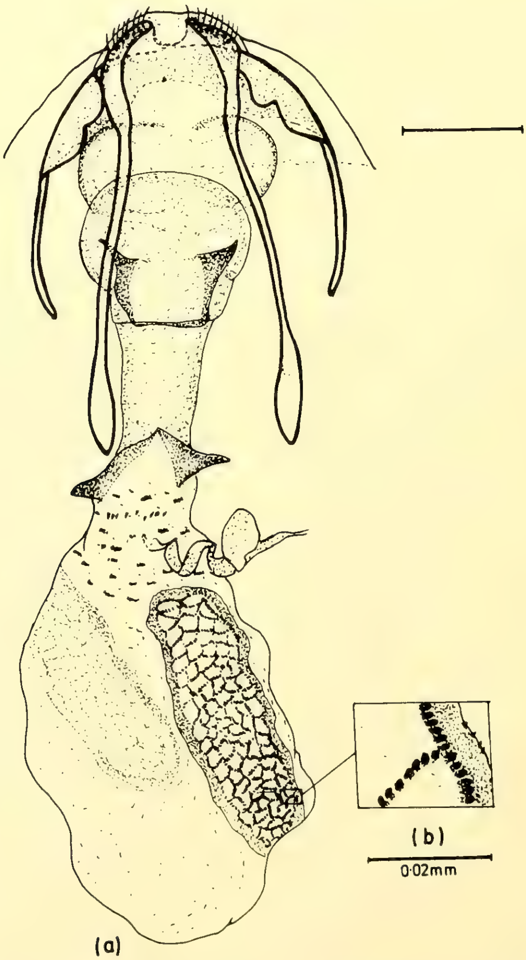


Fig. 18. *Microcalyptris bipinnatellus*. Female genitalia. a, genitalia; b, enlarged detail of signum.

page 65, by the complex ornamentation of the ductus and the ovate signa in *bipinnatellus*.

Discussion. Perhaps most closely related to *thoracealbella* judging from externals and male genitalia. This new species is represented by a well mounted and prepared type series collected by Hodges comparatively recently.

Distribution. USA: Florida.

Material examined. ♂ Holotype: "Florida Lake Placid Archbold Bio. Sta. 1—8 June 1964 R. W. Hodges"; slide no: USNM 17282; in ANS. Paratypes: In USNM: Florida, Lake Placid, Archbold Bio. Sta.; 1♀, 1—7.v.1964, 3♀, 8—15.v.1964 (Hodges). Florida, Fisheating Cr. Palmdale; 1♀, 7—10.v.1964 (Hodges). Florida, Parker Is., Highlands Co.; 1♂ 26—29.v.1964 (Hodges). Florida, Roy. Palm State Park; 1♂, 3♀, i.1930 (Jones, F. M.); slide nos: USNM 17240, 17241, 17253, 17281, 17302, 17303, 17427, 17428, 17247.

Biology. Immature stages unknown. Voltinism. Univoltine, with adults on the wing throughout May and in early June.

Etymology. Pinna (Latin): fin.

Microcalyptris postalatratus sp.n.
(figs. 3, 19)

Description. External features: ♂ (fig. 3). Head: palps greyish; antennae pale brown; tufts on front of head and vertex dark brown; eye-caps creamy white, lustrous; collar dark brown. Thorax and abdomen buff with scattered brown scales, abdomen shining metallic grey beneath. Forewings: ground colour of

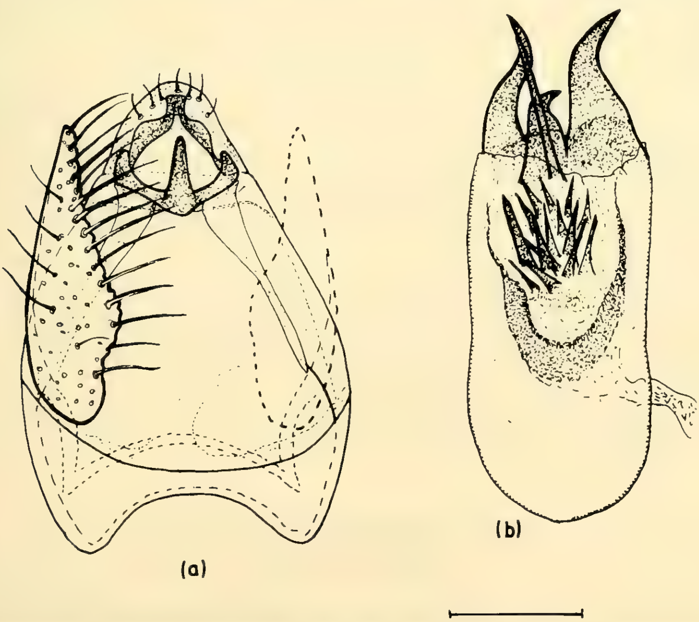


Fig. 19. *Microcalyptris postalatratus*. Male genitalia. a, genital capsule; b, aedeagus.

dorsal surface buff, with each scale dark brown at the tip; fringe greyish with several purplish black scales at the base of the dorsal margin, otherwise shining metallic grey; ventral surface with an oval patch of purplish black scales extending to two thirds. Hindwings: dorsal and ventral surfaces covered with purplish black scales extending almost to the apex; fringe greyish, shining metallic grey. Legs pale greyish brown with metallic grey reflections behind.

Female. Not known.

Wing expanse: ♂: 3.4 mm (paratype); holotype: 5.4 mm.

Genitalia: ♂ (fig. 19). Pseuduncus with a single rounded lobe and uncus bridge-like with a spatulate central process. Gnathos: transverse ventral plate with a large medial process, tapering distally; dorso-lateral arms blunted with short posteriorly-directed processes. Vinculum: lateral arms with associated weakly sclerotised bars broad at the base; ventral plate reduced. Saccus narrow, bilobed with each lobe as long as broad at base. Valves not reaching the pseuduncus, narrow and tapering distally. Transtillae: broadly W-shaped as in fig. 19a, lateral arms long and narrow, ventral arms short; transverse bars fused to form a continuous arcuate strap. Juxta membranous. Aedeagus: broad and regular, equal to length of capsule; vesica well defined with cornutus in form of many large denticles distally and a cup-shaped plate of minute papillae; anellus comprising a pair and two single tooth-like spines. Female not known.

Host plant: Not known.

Mine: Not known.

Diagnosis. The striking contrast between the forewing ground colour and the purplish black scales of the hindwing separate this from all the other members of the genus discussed here. The genitalia resemble those of other members of the genus but may be differentiated by the short, rounded lobe of the pseuduncus, the short lobes of the saccus and the rather broad, squat appearance of the aedeagus.

Discussion. Externally this species appears not closely related to any other in the genus as it is presently understood but the male genitalia correspond well. Further collection and the rearing of females especially, may make its affinities within the genus more clear. Described from two specimens collected by Braun in Arizona, but she failed to name them and identify them as belonging to her genus *Microcalyptris*.

Distribution. USA: Arizona.

Material examined. ♂ Holotype: USA: "Chiricahua Mts., nr. Portal, Arizona. 4.vii.1939, A. F. Braun"; slide no: 150— PJN; in ANS. Paratype: In ANS: Arizona, Superior; 1♂, 11.vii.1939 (Braun); slide no: 151—PJN.

Biology. Immature stages unknown.

Etymology. Atratus (Latin): dressed in black.

Microcalyptris distaleus sp.n.

(figs. 5, 20, 21)

Description. External features: ♂♀ (fig. 5). Head: palps whitish; antennae pale brown; tuft on front of head whitish ochre, vertex whitish; eye-caps white; collar

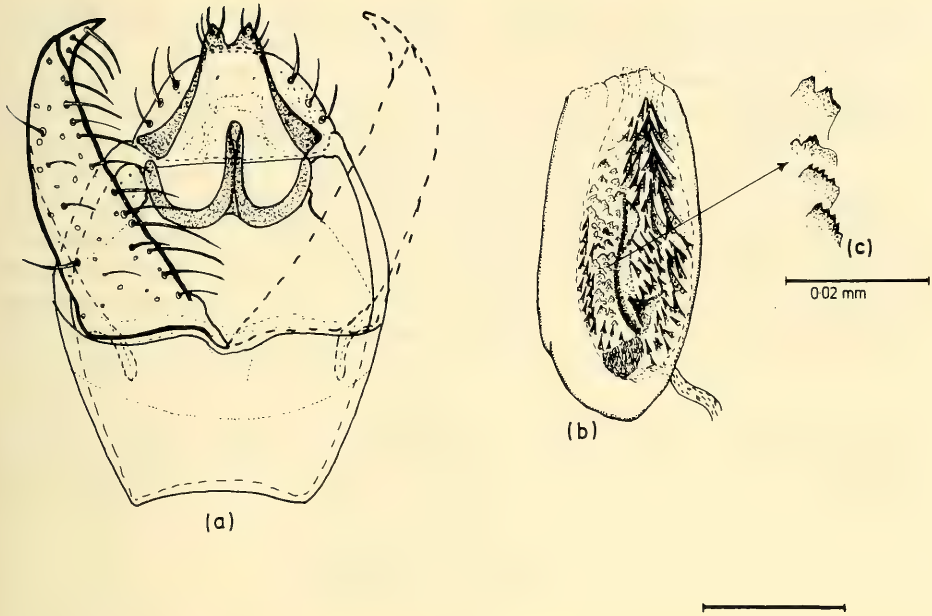


Fig. 20. *Microcalyptris distaleus.* Male genitalia. a, genital capsule; b, aedeagus; c, detail on vesica enlarged.

creamy white. Thorax and abdomen creamy white, abdomen with metallic reflections beneath. Forewings: ground colour of dorsal surface white, sparsely irrorate with scales brown at the tip, shining silver; fringe whitish, shining silver. Hindwings: ground colour and fringe pale greyish white with scattered darker areas.

Wing expanse: ♂: 5.2 mm (1 specimen); ♀: 4.2 mm (1 specimen). Holotype: 6.2 mm.

Genitalia: ♂ (fig. 20). Pseuduncus with broad single lobe, uncus bridge-like bifurcate and papillate extending beyond pseuduncus. Gnathos: as in fig. 20a, transverse ventral plate with large medial process; dorso-lateral arms long and narrow. Vinculum: apparently lacking associated sclerotised bars; ventral plate broad with medial excavation. Saccus as broad as ventral plate, very weakly bilobed. Valves: reaching just beyond the pseuduncus, tapering markedly and pointed terminally. Transtillae: with short, stout lateral arms; transverse bars indeterminate. Aedeagus: markedly shorter than the capsule, regular in width; vesica with cornuti as many small denticles orientated in a ridge laterally and with a large medial spine as in fig. 20b and also with a cup-shaped plate of minute papillae.

Female (fig. 21). Colliculum membranous. Ductus bursae long, expanding distally. Accessory duct arising distally with a single patch of spines at the vestibule, spiral distally. Bursa copulatrix: large and covered proximally with short chains of weakly sclerotised pectinations; signum double, comprising two equal bands of spinose cells with whorls of pectinations as in fig. 21a and b. Anterior

apophyses short and broad. Posterior apophyses long and straight, markedly longer than the anteriores.

Host plant: Not known.

Mine: Not known.

Diagnosis. Rather paler than the other members of the genus, listed on page 65, except for Specimen 12; the scattered brown scales of the forewing in *distaleus* separate the two. The male genitalia are easily differentiated by the markedly tapering valves, the papillate sclerotisation of the pseuduncus and the orientation of the cornuti. The female genitalia resemble those of *thoracealbella* and *punctulata* in the form of the signa, but the absence of any sclerotisation on the ductus and the spiculate accessory duct, in *distaleus*, are diagnostic.

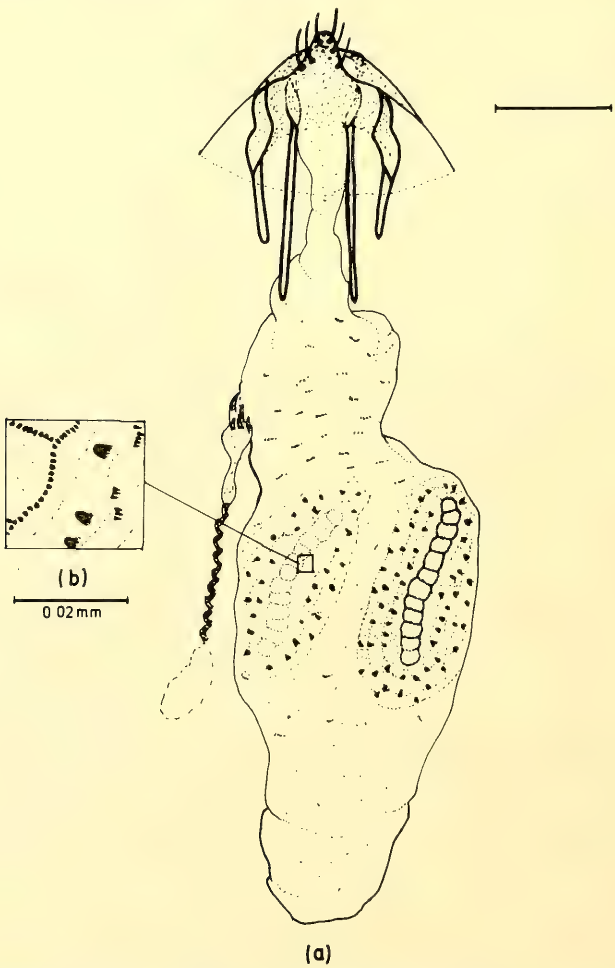


Fig. 21. *Microcalyptris distaleus*. Female genitalia. a, genitalia; b, detail of signum enlarged.

Discussion. This species is rather atypical of the genus, because the male lacks the characteristic lateral bars associated with the vinculum and gnathos, the

complex form of the anellus and differs in the overall nature of the aedeagus. The female is also atypical in the absence of an antrum and the associated sclerotisation of the ductus which is found in the other known members of the genus. Especially the wing venation and general aspects of both male and female genitalia do, however, indicate that it is congeneric with *thoracealbella*.

Distribution. USA: Arizona; California.

Material examined. ♂ Holotype: USA: "Flagstaff, Arizona, 18.vii.1939, A. F. Braun"; slide no: 153—PJN; in ANS. Paratypes: In ANS: Arizona, Flagstaff; 1♀, 18.vii.1939 (Braun). California, Loma Linda; 1♂, 14.vi.1912 (Pilate); slide nos: 152—PJN, 154—PJN.

Biology. Immature stages unknown.

Etymology. Talea (Latin): slender staff or rod; dis (Latin): without.

The two new species following are recently published by my colleague Dr. D. R. Davis in a paper entitled "New Leaf-mining Moths of the Family Nepticulidae from Florida." Thus there is no need to treat them in full, but a diagnosis and other important details are given for the sake of completeness.

Microcalyptris bicornutus Davis
(fig. 7)

Microcalyptris bicornutus Davis, 1978: 212.

Diagnosis. ♂♀. (fig. 7). Fully described by Davis (loc. cit.). Head yellowish. Palps and forewings uniformly greyish brown, paler basally. Scales often tipped with fuscous. Hindwings uniform lighter grey. In females the sternites of the abdomen has a pair of indistinct fenestrae situated near anterior margin, on either side of the mid-ventral line.

Male genitalia (see Davis, loc.cit., figs. 18—20) with blunt, apically flattened pseuduncus. Uncus a bridge-like sclerotisation associated with pseuduncus and gnathos, similar to that of *postalatratus*. Gnathos also similar. Vinculum with a pair of characteristic slender apophyses projecting anteriorly. Valves simple, rounded terminally. Juxta is large, complex and therefore diagnostic; comprising a broad plate, deeply bifurcate anteriorly and posteriorly, producing rounded apodemes directed forwards and pointed apodemes backwards. Aedeagus arcuate, without cornuti, but having typical large canine tooth-like spine on anellus.

Female genitalia (Davis, loc.cit., fig. 32) have the usual very long posterior apophyses. Bursa copulatrix membranous with a pair of asymmetrical signa; each signum mostly comprising a single row of 20—31 scalariform 'cell' elements with thickened margin.

Discussion. The species is described from a large series of 48 types. They were collected as adults so the host plant, mine and biology of the immature stages are unknown. *M. bicornutus* is apparently univoltine with a flight period between September and late November.

The long support rods extending from the gnathos in the male and the very long posterior apophyses in the female are of particular interest in *Microcalyptris* species.

Distribution. USA: Only known from Florida Keys.

Material examined. ♂ Holotype: USA: "Key Largo, Monroe Co., Florida; 19.xi.1964. Mrs. Spencer Kemp". ♂ genitalia USNM 16938 Holotype USNM 72105 in USNM. Paratypes. In USNM: 40♂, 7♀, data as holotype, 8.x.—20.xi.1964, 29.ix.1972.

Microcalyptris tenuijuxtus Davis
(fig. 8)

Microcalyptris tenuijuxtus Davis, 1978: 216.

Diagnosis. ♂♀ (fig. 8). Described by Davis (loc.cit.); the following characters separate this species from the others described here. Almost entire moth pale yellowish white, forewing with some brown irrorations in basal two thirds and increasing distally including fringe almost forming two brown fasciae in some specimens (e.g., Holotype). Hindwing white to pale yellowish. Abdominal fenestrae absent.

Male genitalia (see Davis, loc.cit., figs. 21—23). Pseuduncus characteristic with a median lobe, a pair of spine-like lobes and a pair of rounded lobes arising from it; median lobe (probably uncus) with four small apical setae and the pair of rounded lobes, each with one seta. Gnathos horn-like and bearing the lateral support rods. Vinculum with anterior apophyses moderately well developed. Valves slender and rounded apically. Juxta in shape of inverted T with arms rounded and stem bifurcate at tip. Aedeagus characteristic with about three apical spines and rounded lobes apically.

Female genitalia (Davis, loc.cit., fig. 33). Posterior apophyses again very long. Bursa copulatrix without signa. Accessory duct present with spiral distally as in *bicornutus*.

Discussion. This species is described from 22 specimens, but only one is female. It is somewhat unusual in that the female has no signa on the bursa, and the male has the curious development on the pseuduncus. The host plant, mine and immature stages are unknown. The species is probably univoltine although the range of collecting dates (early October to late November) may simply reflect the periodicity of the collector.

Distribution. USA: Florida Keys.

Material examined. ♂ Holotype: USA: "Key Largo, Monroe Co., Florida, 17.xi.1964. Mrs. Spencer Kemp." ♂ genitalia USNM 1680, Holotype USNM 72106 in USNM. Paratypes. In USNM: 20 ♂, 1 ♀ same data as holotype, 8.x.—28.xi.1964.

Fomoria Beirne, 1945

Fomoria Beirne, 1945: 208. Type species by original designation: *Fomoria weaveri* (Stainton).

Taxonomic history

The genus was originally described by Beirne (1945) as a European genus with

two species *weaveri* and *septembrella* (Stainton) transferred to it from "*Nepticula*" von Heyden, 1843 — a junior synonym of *Stigmella* Schrank, 1802 (see Wilkinson, 1978: 13).

The original generic description was based on the structure of the male genitalia. Comment was made on the colour of the head and wings and also on larval habits. However, venation and female structures were not discussed although venation, at least, is characteristic.

The two species which are here transferred to *Fomoria* are the first North American species to be recognized as belonging to this genus.

Generic description

External features: ♂♀. Head: palps extending well beyond labrum, pale in colour; antennae approximately half the length of the forewing, pale or brown annulate with paler areas; tuft on front of head brown or ochreous, vertex concolorous; eye-caps white, sometimes with fuscous scales distally; collar as vertex. Thorax dark brown to black and iridescent. Abdomen brown and iridescent gold or silver. Venation: as in fig. 22. Forewings: Media coalescing with Cubitus at base and both passing obliquely to Radius at R_{2+3}; Cubitus becoming obsolete; R_4 and R_5 separate. Hindwings: Media single-branched. Forewings: elongate and ovate in shape, ground colour of dorsal surface brown, sometimes

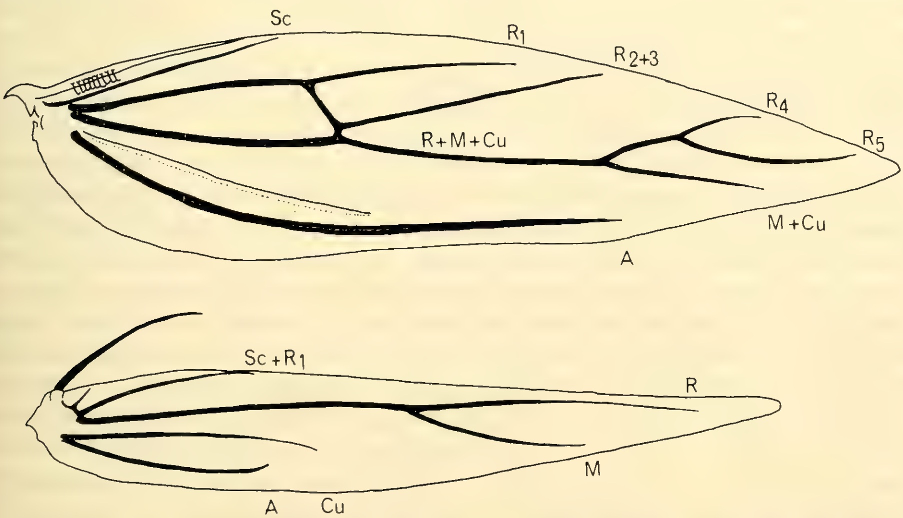


Fig. 22. *Fomoria* sp. Wing venation.

with scales darker at the tips; fringe brown or grey and marked apically with a band of wing scales; markings either absent or in the form of silver fasciae or patches. Hindwings: narrow and lanceolate, brown. Legs: brown or ochreous, sometimes annulate with paler areas; proximal pair of spurs on hind-tibiae below the middle.

Male genitalia: vinculum always ring-shaped; tegumen fused with vinculum dorsally, extending into long, bluntly pointed pseuduncus. Uncus sclerotised with spatulate medial projection. Gnathos with medial arms fused to form posterior central boss or tapering process, rarely with anterior medial projection, lateral arms usually broad and straight. Saccus weakly bilobed. Valves tapering markedly and in Nearctic species with large dorsal spine. Transtillae broadly W-shaped; transverse bars continuous. Juxta present in Palaearctic species as complex, heavily sclerotised plate; absent in Nearctic species. Aedeagus: regular or weakly flask-shaped, usually equal to length of capsule; vesica usually adorned with small denticles and with a complex plate of minute papillae; several pairs of heavily sclerotised, sometimes elaborate, cornuti and anellar spines.

Female genitalia: apophyses approximately equal to length of ductus. Colliculum with sclerotised funicular antrum or complex plates. Ductus denticulate and with spiral accessory duct and sac. Bursa copulatrix: large and variously pectinate; signum double, comprising weakly sclerotised, linear, reticulate patches.

Mining habit: leaf mines; larvae often recorded as pupating within the mines.

Generic differential diagnosis. See page 63.

Fomoria pteliaeella (Chambers) comb.n.
(figs. 9, 23, 24)

Nepticula pteliaeella Chambers, 1881: 137; 1882: 276.
Nepticula pteliaeella Chambers; Dyar, 1903: 546.
Nepticula pteliaeella Chambers; Braun, 1917: 168.
Nepticula pteliaeella Chambers; Braun, in Forbes, 1923: 86.
Nepticula pteliaeella Chambers; McDunnough, 1939: 107 (no. 9721).

Description. External features: ♂. Head: palps greyish; antennae dark grey; tufts on front of head and vertex brown; eye-caps shining white; collar very dark brown. Thorax very dark brown to black, strongly iridescent silver. Abdomen dark brown with scattered gold reflections above, shining metallic grey beneath. Forewings: ground colour of dorsal surface dark brown with bronze reflections, fringe greyish brown, shining silver at apex, with an apical band of dark brown wing-scales; basal patch on dorsal margin, silver, followed by a single antemedial fascia, shining silver and widening on dorsal margin, two marginal streaks, postmedial, almost touching in the middle, both shine silver but have dusted appearance when viewed from certain angles. Hindwings: ground colour and fringe greyish brown, shining metallic grey. Legs dark brown with metallic grey reflections, yellowish behind (fig. 9).

Female. As ♂ except for a pair of convex external pockets ventrally on the third abdominal segment, medial in position.

Wing expanse: ♂: 4.0—5.0 mm (8 specimens); ♀: 3.8—5.4 mm (11 specimens).

Genitalia: ♂. (fig. 23). Pseuduncus with a single tapering lobe and associated sclerotisation with a medial spatulate process as in fig. 23a. Gnathos: an inverted V as in fig. 23a; transverse ventral plate with a large, pointed medial process; dorsolateral arms broad and straight. Vinculum: triangular as in fig. 23a; lateral arms

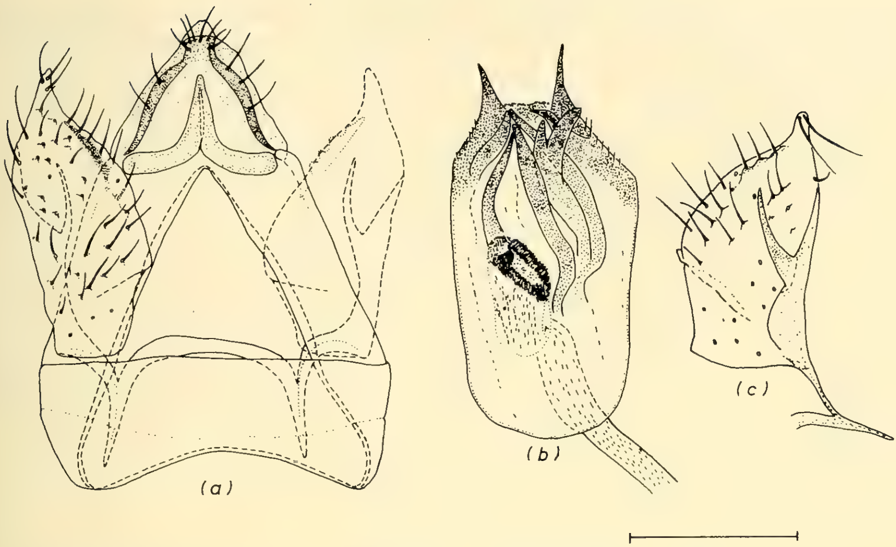


Fig. 23. *Fomoria pteliaeella*. Male genitalia. a, genital capsule; b, aedeagus; c, valve.

very broad; ventral plate broad. Saccus narrower than the ventral plate, weakly bilobed. Valves not reaching pseuduncus, tapering markedly and with dorsal spine arising medially not reaching beyond the cuiller as in fig. 23c. Transtillae: W-shaped as in fig. 23a; lateral arms short and narrow; ventral arms long, reaching beyond the ventral plate; transverse bars fused. Aedeagus: broad and regular, shorter than length of capsule; vesica with between five and ten very large cornuti and with a plate of minute papillae as in fig. 23b; anellus comprising a pair of broad lateral spines.

Female (fig. 24). Colliculum with a weakly sclerotised funicular pocket as in fig. 24a. Ductus bursae short and narrow with accessory duct arising medially, becoming spiral distally. Bursa copulatrix: large and covered with short, heavily sclerotised chains of pectinations proximally and heavily sclerotised denticles distally, both of which are on striations of the bursa; signum double comprising a pair of long cellular patches, unequal in length as in figs. 24a and b. Anterior apophyses very long and slightly arcuate distally. Posterior apophyses straight and narrow, not reaching the anteriores.

Host plant: *Ptelea trifoliata* (Hop-tree).

Mine: An upper surface ophionome.

Diagnosis. Differs externally from *hypericella* in the strongly iridescent nature of the thorax of *pteliaeella* and in the absence of wing markings in *hypericella*. Both male and female genitalia resemble those of *hypericella* but may be separated by the pointed median process of the gnathos, the relatively shorter aedeagus and the larger and more numerous cornuti at the phallotreme in *pteliaeella*; the females differ in that the funicular antrum lacks the heavy sclerotisation and the lance-shaped plate found in *hypericella*.

Discussion. Obviously related to *hypericella* in the overall form of both male and

female genitalia and particularly in the large dorsal spine of the valves. First described by Chambers (1881) from larva and mine and then later (1882) from the adult he had reared.

Distribution. USA: Ohio.

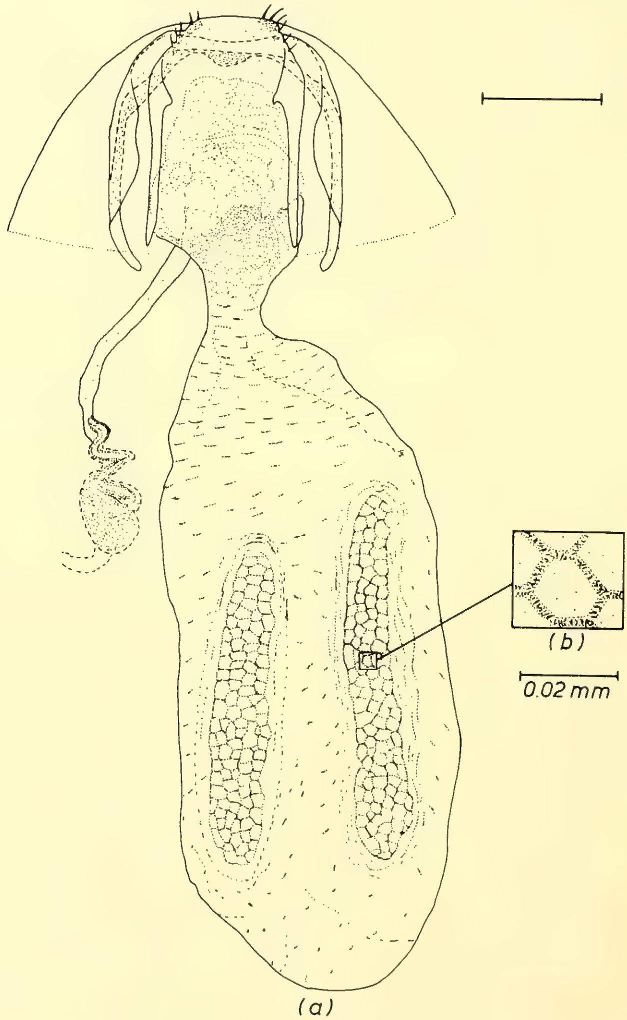


Fig. 24. *Fomoria pteliaeella*. Female genitalia. a, genitalia; b, detail of signum enlarged.

Material examined. In ANS: Ohio, Cincinnati; on *Ptelea trifoliata*; 1 ♂, 9.vi.1917, 2 ♂ 3 ♀, 7 ex., 11.vi.1917, 1 ♀, 19.vi.1917, B.736 (Braun). Ohio, Clermont County; on *Ptelea trifoliata*; 1 ♂, 5.vi.1916, 1 ♂, 2.v.1921, 1 ♂, 2.v.1921, 1 ♂, 21.v.1921, 2 ♂, 1 ex., 23.v.1921, 1 ♂, 24.v.1921, 3 ♂, 3 ♀, 25.v.1921, 1 ♀, 26.v.1921, B.736 (Braun). In USNM: Ohio, Clermont County; on *Ptelea trifoliata*; 2 ♀, 25, 26.v.1921, B.736 (Braun). In Zoölogisch Museum, Amsterdam. Ohio,

Cincinnati, 3 ♂, 11.vi.1917, B.736 (Braun). Mines examined: in ANS: Ohio, 1 mine on *Ptelea trifoliata*; date not certain, B.736 (Braun).

Biology. Egg. Laid on the lower surface of the leaf and, in the single case examined, next to a vein.

Mine. An upper surface, much contorted linear mine with rather undulating margins in the later portion. The frass is evenly scattered across the breadth of the mine in the earlier portion, but is a continuous central line distally.

Larva. Emerges on the upper surface of the leaf prior to pupation.

Pupa. Cocoon dark brown (Braun) or yellowish green (Chambers).

Voltinism. Braun (1917) reports that larvae may be collected in July, August and September, and that the species is bivoltine. The material examined here represents a single generation, the adults being on the wing in late May and June. This agrees with Chambers' findings.

Fomoria hypericella (Braun) comb.n.
(figs. 10, 25, 26)

Nepticula hypericella Braun, 1925a: 17.
Nepticula hypericella Braun; McDunnough, 1939: 107 (No: 9768).

Description. External features: ♂ ♀. Head: palps grey; antennae greyish brown, faintly annulate with paler areas; tuft on front of head orange-ochreous, vertex darker; eye-caps shining white, sometimes shading to fuscous distally; collar pale

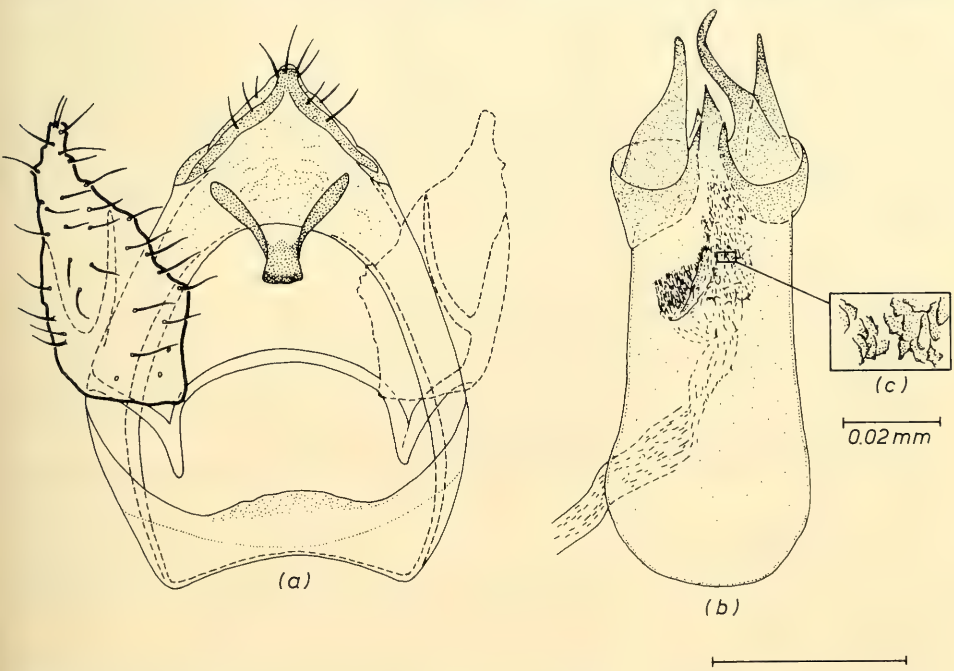


Fig. 25. *Fomoria hypericella.* Male genitalia. a, genital capsule; b, aedeagus; c, detail on vesica enlarged.

ochreous. Thorax and abdomen dark brown, thorax with greyish lustre, abdomen shining metallic grey beneath. Forewings: ground colour of dorsal surface greyish brown, each scale darker at the tip, various reflections but predominantly grey and bronze; fringe greyish shining metallic grey, with an apical band of dark brown wing-scales. Hindwings: ground colour and fringe brownish, shining metallic grey. Legs greyish brown, paler and shining metallic grey behind, tarsi faintly annulate with buff (fig. 10).

Wing expanse: ♂: 4.0—4.8 mm (8 specimens); ♀: 3.8—5.0 mm (9 specimens). Holotype: 5.0 mm.

Genitalia: ♂. (fig. 25). Pseuduncus with a single, tapering lobe and uncus sclerotised with a medial spatulate process as in fig. 25a. Gnathos: an inverted V with transverse ventral plate forming a broad and flat central boss; dorso-lateral arms short. Vinculum: lateral arms broad; ventral plate narrow, with a medial convex expansion. Saccus very narrow, bilobed. Valves just reaching the pseuduncus, tapering markedly into a broad point, with dorsal spine arising medially just reaching cuiller as in fig. 25a. Transtillae: broadly W-shaped as in fig. 25a; lateral arms short and narrow; ventral arms blunted, not reaching the ventral plate. Aedeagus: flask-shaped, approximately equal to length of capsule; vesica with cornuti as many small spiculate plates and with a comma-shaped plate of minute papillae; anellus comprising two pairs of very large tooth-like spines and single spines.

Female (fig. 26). Colliculum with a weakly sclerotised funicular antrum and a lance-shaped chitinous plate. Ductus bursae short and as broad as the bursa copulatrix. Accessory duct arising from the area of sclerotisation, spiral distally. Bursa copulatrix: long and narrow with short heavily sclerotised chains of pectinations proximally and heavily sclerotised denticles distally, both of which are on striations of the bursa; signum double, comprising an equal pair of long, cellular patches as in figs. 26a and b. Anterior apophyses long and narrow. Posterior apophyses straight and narrow, approximately equal to length of the anteriores.

Host plant: *Hypericum prolificum* (St. John's Wort).

Mine: An upper surface ophionome.

Diagnosis. The uniform colour of the forewings and the absence of any markings separate this species from *pteliaeella*. The quadrate median process of the gnathos, the larger aedeagus and the more complex anellar projections in *hypericella* distinguish the male genitalia from those of *pteliaeella*, while the more heavily sclerotised antrum of *hypericella* separates the females.

Discussion. Originally described from holotype and 18 paratypes all reared by Braun.

Distribution. USA: Ohio.

Material examined. ♀ Holotype: USA: "B. 1103; Eastwood O., i. 13.viii.1923, Annette F. Braun; Type; *Nepticula hypericella* Braun Type"; on *Hypericum prolificum*; slide no. 110—PJN; in ANS.

Paratypes: in ANS: data as Holotype: 1 ♂, 1 ♀, 6.viii.1923, 2 ♂, 2 ♀, 8.viii.1923, 1 ♂, 10.viii.1923, 5 ♀, 11.viii.1923, 3 ♂, 12.viii.1923, 1 ♂, 16.viii.1923, 1 ♀,

20.viii.1923, B.1103 (Braun); slide nos: 111—PJN, 112—PJN, 113—PJN, 114—PJN, 115—PJN.

Mines examined: In ANS: Ohio, Eastwood; 2 mines on *Hypericum prolificum*; 20.vii.1923, B.1103 (Braun).

Biology. Egg. Laid on the lower surface of the leaf, adjacent to the midrib.

Mine. A very long, slender tract on the upper surface. The frass is deposited centrally as a continuous line in the early portion but later more generally scattered.

Larva. Emerges on the lower surface of the leaf. Braun reports that occasion-



Fig. 26. *Fomoria hypericella*. Female genitalia.

ally pupation occurs within the mine, with the anterior edge of the cocoon placed at the slit in the leaf surface.

Pupa. Cocoon pale brown in colour.

Voltinism. Univoltine in Ohio, the adults being on the wing in August.

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My thanks are due to Mr. Philip Newton who whilst my research assistant in England helped considerably with dissections and drafting some species descriptions. I am very grateful to Dr. Georgina Bryan (FUA) who assisted with final checking and proof reading and to Dr. D. R. Davis (USNM) for his hospitality, helpful discussions and for arranging the loan of specimens. I acknowledge Mr. G. W. H. van den Berg and Mr. S. Paniry for their help with the illustrations.

REFERENCES

Beirne, B. P., 1945. The Male Genitalia of the British Stigmellidae (Nepticulidae) (Lep.). — Proc. R. Ir. Acad., (B) 50 (9): 191—218, 81 figs.

Braun, A. F., 1910. New species of Tineina from California. — Ent. News. 21 (4): 171—179.

———, 1915. New genera and species of Tineina. — Can. Ent. 47 (6): 188—197, 6 figs.

———, 1917. Nepticulidae of North America. — Trans. Am. ent. Soc. 43 (762): 155—209, 4 pls.

———, 1923. Superfamily Nepticuloidea. Family 5. Nepticulidae. — In: Forbes, W. T. W. (ed.), Lepidoptera of New York and Neighbouring States. pp. 79—98, 10 figs.

———, 1925a. Some undescribed Microlepidoptera and notes on life histories. — Trans. Am. ent. Soc. 51: 13—17.

———, 1925b. Microlepidoptera of Northern Utah. — Trans. Am. ent. Soc. 51 (3): 183—226.

Busck, A., 1907. New American Tineina. — Proc. ent. Soc. Wash. 16: 46—54, 143—150.

Chambers, V. T., 1873. Micro-Lepidoptera. — Can. Ent. 5 (7): 124—128.

———, 1876. Tineina. — Can. Ent. 8 (8): 158—160.

———, 1878. Index to the described Tineina of the United States and Canada. — In: Hayden, F. V. (ed.), Bull. U. S. geol. geogr. Surv. Territ. 4: 125—167.

———, 1881. Further notes on some Tineid larvae. — Psyche 3: 135—137, 147—149.

———, 1882. *Nepticula pteliaeella* n. spec. — Psyche 3: 276.

Davis, D. R., 1978. New Leaf-mining Moths of the family Nepticulidae from Florida. — Florida Entomologist 61 (4): 209—224, 36 figs., 1 map.

Dyar, H. G., 1903. List of North American Lepidoptera and key to the literature of this order of insects. — Bull. U. S. natn. Mus. 52: xix + 723 pp. Washington.

Heyden, C. von, 1843. Amtliche Bericht der Versammlung der Naturforscher zu Mainz: 208 pp.

McDunnough, J., 1939. Checklist of the Lepidoptera of Canada and the United States of America, part II. Microlepidoptera. — Mem. So. Calif. Acad. Sci. 2 (1): 1—171.

Schrank, F. von P., 1802. Fauna boica. 2 (2) 412 pp. — Nürnberg.

Wilkinson, C., 1978. On the *Stigmella-Nepticula* controversy (Lepidoptera). — Tijdschr. Entom. 121 (2): 13—22, pls. 1—2.

Wilkinson, C. & M. J. Scoble, 1979. The Nepticulidae (Lepidoptera) of Canada. — Mem. Canad. Ent. 107: 1—118, 61 figs., 10 pls.

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PHYLOGENIE UND SYSTEMATIK DER TIPULIDAE

von

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Mit fünf Abbildungen

Vorwort

In den letzten fünfzig Jahren ist von mehreren Spezialisten an der Taxonomie der Tipuloidea gearbeitet worden, wodurch sich die Zahl der bekannten Arten vervielfachte. In diesem Zeitraum erschienen auch die ersten Arbeiten über Anatomie, Vergleichende Morphologie, Physiologie, Cytologie und Biologie der Tipuloidea, und Larven, Puppen und Fossilien einer Reihe von Arten wurden bekannt. Unser Freund Eugen Nikolajewitsh Savtshenko hat als erster die Ergebnisse aller dieser Diziplinen zur Nachprüfung der Stammesgeschichte der Tipuloidea benützt, und damit einen wichtigen Beitrag zur Kenntnis der Phylogenie der Dipteren, von denen die Tipuloidea die älteste Gruppe darstellen, vorgelegt.

Diese Arbeit erschien ursprünglich in ukrainischer Sprache. Das Institut für taxonomische Zoologie der Universität von Amsterdam hat es Frau E. Hanicenko ermöglicht, sie wörtlich ins Holländische zu übersetzen. Basierend auf dieser Übersetzung haben wir mit freundlicher Mithilfe des Autors eine deutsche Bearbeitung fertiggestellt für diejenigen, die die ukrainische Sprache niet beherrschen.

Auf Vorschlag des Autors sind gegenüber der ursprünglichen Ausgabe einige kleine hauptsächlich nomenklatorische Änderungen eingearbeitet worden, wodurch die Arbeit wieder up to date ist. Die Figuren wurden von Herrn J. Zaagman (Institut für taxonomische Zoologie, Amsterdam) neugezeichnet und für diese Ausgabe fortlaufend numeriert.

Phylogenie und Systematik der Tipulidae

Die Tipulidae gehören zusammen mit den anderen Tipuloidea (Trichoceridae, Cylindrotomidae, Limoniidae, Tanyderidae und Ptychopteridae) zu der natürlichen Entstehungsgruppe der niederen Nematocera, die als monophyletisch gilt. Es ist deshalb zweckmäßig diese Familien nicht gesondert, sondern in ihrem Zusammenhang zu betrachten.

Die Phylogenie der Tipuloidea

Die Tipuloidea gehören, wie alle anderen Dipteren, zu den Mecopteroidea oder der Panorpoiden-Gruppe der Insekten. Ihren Ursprung haben sie in den mesozoischen Panorpiden (Tillyard, 1918; Handlirsch, 1939).

Die Tipuloidea und die heutigen oder schon ausgestorbenen Panorpiden haben viele morphologische Merkmale gemeinsam, was auf nahe Verwandtschaft hinweist (Bodenheimer, 1924). Die Tipuloidea haben folgende ursprüngliche Merkmale, wenn auch in etwas abgeänderter Form, von den Panorpiden übernommen und behalten:

a. in beiden Geschlechtern dichoptische Augen und vielgliedrige Fühler mit etwa gleichgeformten Fühlergliedern;
b. ein ziemlich kompliziertes Flügelgeäder, besonders in den Hauptstämmen der Adern: Radius vierästig, eine m-cu-Querader, deutliche Reste eines zweiten Cubitus in Form einer Falte entlang cu_1 und zwei Analadern, außerdem das atavistische Vorkommen einiger anormaler Queradern — besonders in den radialen und medialen Zellen der Flügelspitze, wo solche auch bei den Urformen sehr lange gefunden wurden (Rohdendorf, 1960);
c. das sporadische, wahrscheinlich atavistische Vorkommen von Makrotrichien in den Flügelzellen bei Arten von Artengruppen, deren andere Arten alle unbehaarte Flügel haben (z.B. *Nephrotoma quadristriata* (Schummel) bei den Tipulidae); eine Querzeichnung der Flügel, die charakteristisch ist für einige Tipulidae (*Tipula trifasciata* Loew und andere), Limoniidae und Ptychopteridae;
d. eine V-förmige Quernaht am Mesonotum, die mit Ausnahme der Tipulidae nur bei wenigen anderen Gruppen von Nematoceren vorhanden ist (z.B. bei den Mycetophilidae), und bei Spezialisation der Dipteren verschwindet;
e. eines der zwei Meronen, die für die Panorpiden charakteristisch sind, ist bei vielen Limoniidae schon weitgehend reduziert und bei höher spezialisierten Dipteren verschwunden (Edwards, 1938).

Die phylogenetische Verwandtschaft der Tipuloidea mit den Panorpiden wird auch bestätigt durch das Vorhandensein von deutlich entwickelten Ozellen bei archaischen Gruppen (Trichoceridae) und von wenigstens rudimentären Ozellen (Slipka, 1950a, 1950b) bei höher spezialisierten Gruppen (Tipulidae); auch durch die homologe Innervierung und Befestigung der Flügel am Thorax bei beiden Gruppen (Zacwilichowski, 1933, 1934) sowie durch homologe Auswüchse an den Tergiten des Abdomens der Larven (Theowald, 1957). Auch die Ernährungsweise der Imagines der Tipulidae ist jener der Panorpiden ähnlich. Sie ernähren sich vom Nektar der Blumen, von Honigtau und von normalem Tau (Stitz, 1926).

Auf Grund von vergleichend-morphologischen und palaeontologischen Gegebenheiten (Martynowa, 1959; Rohdendorf, 1960, 1961, 1962 und 1964) sieht die Entwicklung der mesozoischen Panorpiden bis zu den primitiven Formen der Dipteren und von diesen bis zu den Tipulidae folgendermaßen aus.

Schon im Perm — vor wenigstens 225 Million Jahren — haben sich aus den palaeozoischen Panorpiden, gehörend zu den Permochoristidae, die Paratrichoptera entwickelt. Sie waren später in der Evolution des ganzen Panorpiden-

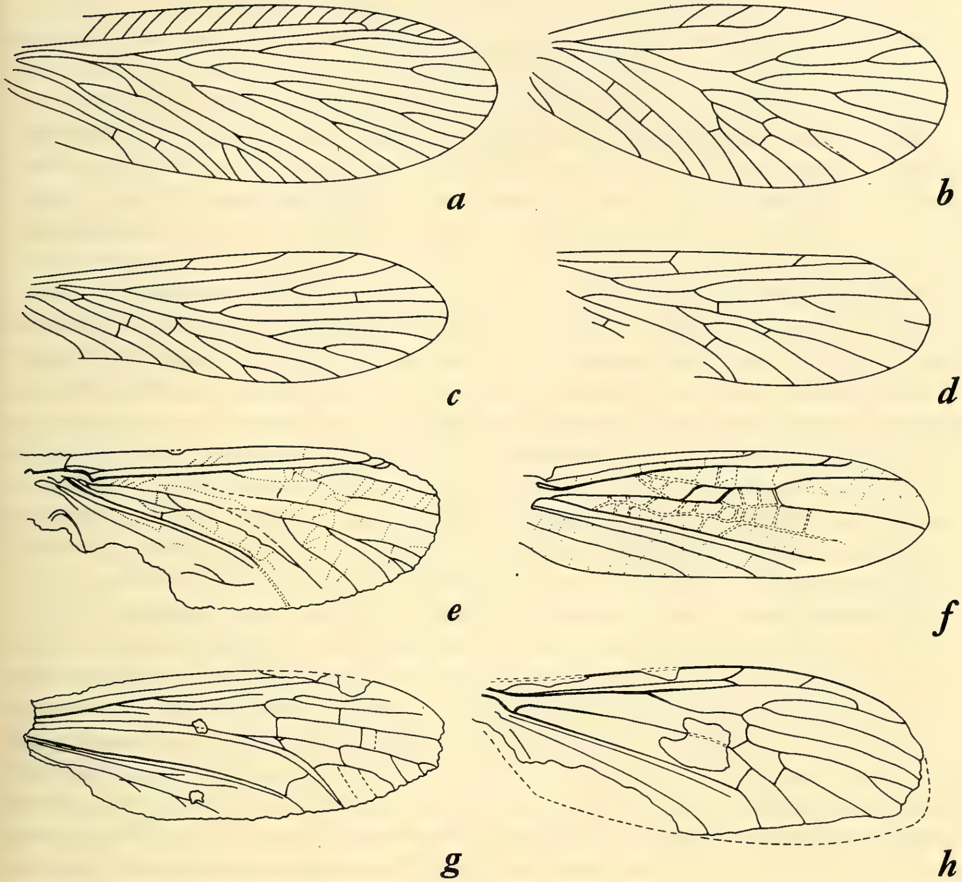


Abb. 1: Geäder der Vorderflügel einiger Ahnen der Tipulidae (nach Rohdendorf): *a* Panorpide aus dem Perm (Platychoristidae); *b, c* Panorpide aus dem Perm (Permochoristidae); *d* Panorpide aus dem Perm (Permotipulidae, Gattung *Permotipula*); *e, f* Archaische Zweiflügler aus dem Trias (Archidiptera) der Familie Dictyodipteridae; *g Diplarchitipula* Rohdendorf (Architipulidae); *h Architipula* Handlirsch (Architipulidae).

Komplexes der Insekten von großer Bedeutung. Diese Gruppe, gekennzeichnet durch eine große ökologische Plastizität, entwickelte sich schnell und breitete sich über immer mehr Biotope aus (Martynova, 1959). In dieser Gruppe begann die Reduktion der Hinterflügel, die schließlich zur Zweiflügeligkeit führte (Dipterismus). Die Vorderflügel der Paratrichoptera unterscheiden sich von denen der anderen palaeozoischen Panorpiden durch eine Anzahl von progressiven Merkmalen wie Kostalisation der Hauptstämme des Flügelgeäders, wodurch sich die Flügelmembran verschmälerte und die cubitalen Adern dicht aneinander zu liegen kamen, Differenzierung der Basis des Radius und Reduktion der Anzahl der Analadern bis auf eine oder zwei (Abb. 1: b, c). Im Gegensatz zu den archaischen Panorpiden aus dem Perm hatten die Paratrichoptera viel weniger

oder gar keine Queradern in den radialen und medialen Zellen der Flügelspitze. Gewöhnlich wurden aber wohl die m-cu Querader und die kleine Querader von den Vorfahren vererbt.

Manche Paratrichoptera-Arten waren, was die Flügeladerung anbelangt, den rezenten Tipulidae ziemlich ähnlich, ganz besonders die Panorpide *Permotipula patricia* Tillyard aus Ablagerungen des Ober-Perm in Australien (Abb. 4: d). Erst als festgestellt wurde, daß dieses Insekt zwei Flügelpaare hat (Tillyard, 1937), wurde es nicht mehr den echten Tipulidae (Tillyard, 1929), sondern den Panorpiden zugeordnet.

Wie auch die heutigen Panorpiden hatten die mesozoischen Arten der Paratrichoptera wahrscheinlich Larven mit vollständig entwickeltem Kopfskelett (eucephal), mit drei Paar gegliederten Thorakalbeinen und mit wenigstens einigen Paaren von Stigmenöffnungen am Hinterleib (peripneustisch). Es gibt genügend Evidenz anzunehmen, daß diese Insekten hygrophil waren und daß sie am Boden in der Nähe von Gewässern unter ziemlich feuchten Umständen umherkrochen (Martynova, 1959). Sie ernährten sich saprophag von verschiedenen schon in Verwesung übergegangenen organischen Bestandteilen und von abgestorbenen Moosblättchen, wenn möglich aber auch von frischem Moos, wie die Larven der heute in Australien vorkommenden Panorpiden-Art *Chorista australis* Klug (Essig, 1942) und die Larven vieler rezenter Tipuloidea einschließlich Tipulidae.

Es ist nicht auszuschließen, daß schon bei den Paratrichoptera im Larvenstadium die Tendenz zu einer amphibischen Lebensweise bestand. Die Larven krochen nicht mehr am Bodem umher, sondern in einer mehr oder weniger verschlammten dünnen Substanz, was ihre Bewegungen erschwerte und langsamer machte (Rohdendorf, 1964). Im Verlauf der weiteren Evolution der ancestralen Formen der Tipuloidea könnte diese Tendenz — die sich in bestimmten morphologischen Anpassungen manifestierte — die Ursache gewesen sein, daß die Larven der Tipuloidea denen der Bibionidae ähnlich wurden; bei den Bibionidae sind der Kopf noch eucephal und die Stigmenöffnungen noch peripneustisch, gegliederte Thorakalbeine fehlen aber, weil sie beim Leben in einer halbflüssigen Substanz funktionell nicht brauchbar sind.

Nach Martynova (1959) haben sich wahrscheinlich aus den Paratrichoptera — nach Verlust der Hinterflügel in der Trias — die ersten primitiven Archidiptera entwickelt, die dem Flügelgeäder nach den Tipuloidea ähnlicher waren als den Paratrichoptera. Kennzeichnend für die Flügel der primitiven Diptera sind der hohe Grad der Versteifung des Flügelvorderrandes, die Differenzierung der Dicke der Hauptstämme der Längsadern, die weitere Reduktion und schließlich die Änderung von cu_2 in eine cu_1 entlang laufende Falte (Abb. 1: e, f).

Von den nur fossil bekannten Archidiptera ist, betreffend die Phylogenie der Tipuloidea, die Familie der Dictyodipteridae aus der Trias von Issyk-Kul in Kazakstan wohl am interessantesten. Rohdendorf (1960, 1964) meint, daß in der Trias in dieser Familie die Grundlage gelegt wird für die echten Zweiflügler (Eodiptera) mit an der Basis verschmälerten und länglichen Flügeln; in den ersten Evolutionsstadien war, was die Flügeladerung anlangt, die Tendenz zur Reduktion der Queradern am Ende des medialen Flügelfeldes kennzeichnend.

Die ersten mesozoischen Eodiptera hatten wie die Archidiptera wahrscheinlich noch Larven des Bibioniden-Typs, die in sehr feuchtem, an organischen Stoffen reichem Schlammboden und möglicherweise auch in seichtem Wasser lebten.

Rohdendorf (1962, 1964) sieht die überaus primitiven Eodiptera als Ahnformen einerseits der Tipuloidea — diese entwickelten sich weiter, lieferten aber keine auf höherem Evolutionsniveau stehenden Nachkommen — und anderseits der Bibionidae, von denen alle höher entwickelten Familien der rezenten Diptera abstammen.

Das Entstehen der Tipuloidea aus den primären Eodiptera fand in der Trias statt. Ihre primitivste Familie sind die Architipulidae, von denen Rohdendorf (1964) alle rezenten Tipuloidea ableitet. Die Architipulidae hatten wie alle heutigen Tipuloidea die charakteristische Verschiebung von r_{2+3} zu r_4 in Richtung Flügelspitze und r_2, der am Ende nicht mit dem Flügelrand sondern mit r_1 verbunden war (Hennig, 1954). Überdies zeichneten sich die Architipulidae durch einen ziemlich langen Radius aus und die primitiveren Formen durch überzählige Queradern im medialen Spitzenfeld der Flügel und manchmal auch durch Verzweigung der Adern m_4 und cu (Abb. 1: g, h). Was die Aderung der Flügel betrifft, unterschieden sie sich nur wenig von den rezenten Tipulidae; deshalb war Handlirsch (1908), der diese Familie beschrieben hat, nicht ganz sicher, ob diese Gruppe wohl den Status einer Familie verdiente oder nicht. Weil er nicht wußte, welcher Gruppe der heutigen Tipulidae er sie am besten zuordnen sollte, hat er sie als Familie aufgeführt (Handlirsch, 1925, 1939).

Schon in der Ober-Trias waren die Architipulidae von wenigstens drei Familien mit einigen Arten vertreten (Rohdendorf, 1964) und im Unter-Jura — besonders im Lias von Deutschland — mit zehn Familien und ziemlich vielen Arten (Handlirsch, 1908, 1939), jedoch mit Ausnahme einiger Arten, die von Bode (1953) beschrieben wurden, weil es zweifelhaft ist, ob diese Arten überhaupt zu dieser Gruppe beziehungsweise zu den Tipulidae gehören.

Der bedeutenden systematischen Differenzierung der Architipulidae, die sie noch vor dem Lias in der Ober-Trias erreicht haben, muß zweifellos ein langfristiger Entwicklungsprozeß der Urformen dieser Familie vorausgegangen sein. Es ist deshalb sehr wahrscheinlich, daß sich die Architipulidae schon viel früher als eine gute Familie gebildet haben, als sie fossil belegt sind, wahrscheinlich schon irgendwann in der Mittel-Trias. Darauf weist die hohe Spezialisation des Flügelgeäders der Architipulidae hin (z.B. das Verschmelzen von m_1 und m_2 bei einigen Formen); ihrem Flügelgeäder nach stehen manche Architipulidae sogar höher als manche rezenten Tipulidae (Hennig, 1954).

Beim Entstehen der direkten Ahnen der rezenten Tipuloidea aus den Urformen der Eodiptera, das mit den Anpassungen ihrer Larven an eine amphibische Lebensweise Hand in Hand ging (Giljarow, 1949), muß die Morphologie der Larven, besonders ihrer Atmungsorgane, wesentlich verändert worden sein. Aus den ursprünglichen peripneustischen Formen sind wahrscheinlich amphipneustische entstanden, die am Vorder- und Hinterende des Leibes ein Paar Stigmenöffnungen hatten, und von diesen wieder metapneustische Formen mit Stigmenöffnungen nur am Hinterende des Abdomens, was für alle rezenten

Tipuloidea mit Ausnahme von einigen Limoniidae (*Antocha*) kennzeichnend ist. Bei diesen ging die Anpassung an das Wasserleben noch weiter, indem apneustische Larven mit völlig isoliertem Tracheensystem ohne Stigmenöffnungen entstanden.

Daß die Larven der Stammformen der Tipuloidea amphipneustisch waren, zeigt sich aus vergleichend anatomischen Untersuchungen (Slipka, 1952). Wie man weiß, steht bei den Insekten mit jedem Paar funktioneller Stigmenöffnungen einer Queranastomose in Verbindung, die in der Körperhöhle die zwei Hauptstämme des Trachealsystems miteinander verbindet. Gleichzeitig mit der Reduktion der Stigmenöffnungen verschwinden auch die Queranastomosen. Bei den metapneustischen Larven der Tipuloidea bleibt nur die Queranastomose im analen Abdominalsegment erhalten, wo sich auch noch funktionelle Stigmenöffnungen befinden. Bei den Larven von *Tipula maxima* Poda, die zu den primitiveren Formen der Tipulidae gehört, wurde aber noch ein zweite Queranastomose festgestellt; diese Anastomose befindet sich im vordersten Teil des Leibes, gleich hinter der Basis des Kopfes, d.h. gerade an der Stelle, an der sich bei den primitiven Formen — soferne sie amphipneustisch waren — das vorderste Paar der Stigmenöffnungen befunden haben sollte.

Als Nachkommen der peri- und amphipneustischen Landformen sollen die metapneustischen Larven aller primitiven Tipuloidea als sekundäre Wasserorganismen angesehen werden. Es gibt keinen Zweifel an ihrem sekundärem Wasserleben, weil sie ein gut entwickeltes Trachealsystem haben, das an das Atmen von atmosphärischer Luft angepaßt ist (Gilgarow, 1949).

Die Tatsache, daß die Tipuloidea als sekundäre Wasserorganismen als ein gesondertes Taxon von höherem Rang gerade in der Trias entstanden sind, ist ganz verständlich. Die Trias war eine der meist geokraten Perioden der Erdgeschichte; in dieser Zeit fand die Regression des Meeres statt und in Zusammenhang damit eine weitgehende Aridisation des Klimas am Festland, das in dieser Zeit den größten Teil der Erdkugel bedeckte (Sinitzyn, 1962). Durch den starken Rückgang einerseits der Luftfeuchtigkeit anderseits des Grundwasserspiegels müssen für das Leben der ancestralen Formen der Tipuloidea, die in allen ihren Entwicklungsstadien sehr hygrophil sind, äußerst ungünstige Umstände entstanden sein. Gegen diese widrigen Umstände muß es für die Vorfahren der Tipuloidea schon in der Unter-Trias Alternativen gegeben haben: entweder sich an aride Umstände anpassen, zeitweise in kleinen Überlebenszonen verbleiben, die noch feucht genug sind, oder aussterben. Die Evolution der Ahnen der Tipuloidea aus der Trias lief wahrscheinlich in Richtung einer Änderung und Anpassung des Organismus an die veränderten Umstände, wobei sie kleine Überlebenszonen, in denen die ökologische Situation am wenigsten verändert war, benützten.

Die ursprüngliche Richtung einer solchen Anpassung war bei den Paratrichoptera aus der Trias sicher die Tendenz zur Entwicklung der Zweiflügeligkeit, was zum Entstehen der zweiflügeligen Insekten führte. Nach Rohdendorf (1964) hat die Zweiflügeligkeit die Möglichkeiten zum Fliegen bedeutend vergrößert und dadurch die Überlebenschancen der spezialisierten Paratrichoptera und der

archaischen Zweiflügeligen vergrößert; die Zweiflügeligkeit hat die Emigration von trockeneren zu feuchteren Biotopen und das Suchen nach den feuchtesten Zonen — günstig für Eiablage und Entwicklung der praeimaginalen Stadien dieser hygrophilen Organismen — auf den großen Flächen erleichtert.

Eine andere Erscheinung dieses Anpassungsprozesses, die sich wahrscheinlich gleichzeitig vollzog, war die Tatsache, daß die Larven der Ahnen der Tipuloidea die Bodenschichten wechselten, ein Prozess, der auch heute in unserer rezenten Fauna bei Schwankung von Feuchtigkeit zu bemerken ist (Gilgarow, 1951). Die Larven der ersten Zweiflügeligen und vielleicht auch ihrer direkten panorpiden Ahnen sind vom Leben auf der Bodenoberfläche zum Leben innerhalb feuchter Moorböden übergegangen und das ist so geblieben bis zur Trennung der ursprüngliche Eodiptera in die Untergruppen der Tipuloidea und der Bibionidea und bei den Bibionidea bis in unsere Zeiten.

Im ersten Stadium der Evolution der Tipuloidea hatten die Larven dieser Untergruppen sich wahrscheinlich als besserer Form zum Benützen guter Überlebenszonen erst dem Leben und der Entwicklung in mit Wasser gesättigten Moorböden angepaßt und erst später eine Lebensweise direkt an den Ufern von seichtem Wasser angenommen; in Zusammenhang damit bildete sich die Untergruppe der Tipuloidea mit den für sie charakteristischen Larven, die die sekundäre Eigenschaft entwickelten, im Wasser zu leben, aber den Sauerstoff aus der Luft zu atmen.

Es ist interessant, daß der Übergang vom Leben auf dem Lande zum Leben im Wasser zusammen mit dem Entstehen von bestimmten hygromorphen Anpassungen als Art des Überlebens bei ungünstigen ariden Umständen auch bei manchen Wirbeltieren festgestellt wurde. Die Labyrinthodonten aus der Trias wurden bei Mangel an Feuchtigkeit gezwungen das Land zu verlassen und ins Wasser zurückzukehren, es erfolgte die Umänderung ihrer Gliedmaßen in Flossen (Sinitzyn, 1962).

Die Bildung der Tipuloidea in der Trias kann als ein interessantes Beispiel dafür dienen, wie — bei wesentlicher und dauerhaften Umänderung der Umwelt über große Flächen der Erde, wobei der Widerspruch zwischen den Anforderungen der Tiere an ihre Umwelt und den dort gegebenen Möglichkeiten verschärft wird — eine tiefgreifende Verzerrung und Umbildung der genetischen Basis verursacht wurde, und in der Folge davon im Evolutionsprozess der Tierwelt das Entstehen von Taxen höheren Ranges und von qualitativen Umänderungen in der Fauna des Festlandes stattfand.

Die Phylogenie der Tipulidae

Es gibt keinen Zweifel, daß die Tipulidae wie alle anderen rezenten Tipuloidea von den mesozoischen Architipulidae abstammen (Rohdendorf, 1964). Es bleibt aber eine offene Frage, ob es eine direkte phylogenetische Relation gibt zwischen den Tipulidae und Architipulidae, oder ob sich aus letztgenannter Gruppe erst eine neue uns noch unbekannte Gruppe entwickelt hat und später aus dieser die der Tipulidae.

Die primitivsten Familien der heutigen Tipuloidea sind die Familien Tany-

deridae, Trichoceridae und Ptychopteridae, Edwards (1926) meint, die Trichoceridae haben ziemlich viele Übereinstimmungen mit eventuellen ancestralen Formen der Tipulidae. Diese drei Familien sind aber morphologisch sehr isoliert von den Tipulidae und nach Rohdendorf (1964) schon viel früher aus den Architipulidae entstanden als die Tipulidae (Abb. 2). Deshalb ist die Meinung, daß sie vielleicht die direkten Ahnen der Tipulidae sind, unbegründet.

Die Limoniidae und die Cylindrotomidae sind näher miteinder verwandt; beide werden manchmal zu derselben Gruppe, den Polyneura gerechnet. Von diesen beiden Familien sind nach Lameere (1906) die Limoniidae die primitivere. Nach dem Flügelgeäder stehen sie jedenfalls den ältesten Zweiflügeligen näher als die Tipulidae. Fast alle Limoniidae haben z.B. die Ader sc_1, die bei den Cylindrotomidae eine Tendenz zur Reduktion sehen läßt und bei den Tipulidae meistens gar nicht vorhanden ist. Bei einigen primitiven Gruppen der Limoniidae hat r_2 die Form einer langgestreckten Ader, und die primären Verzweigungen von

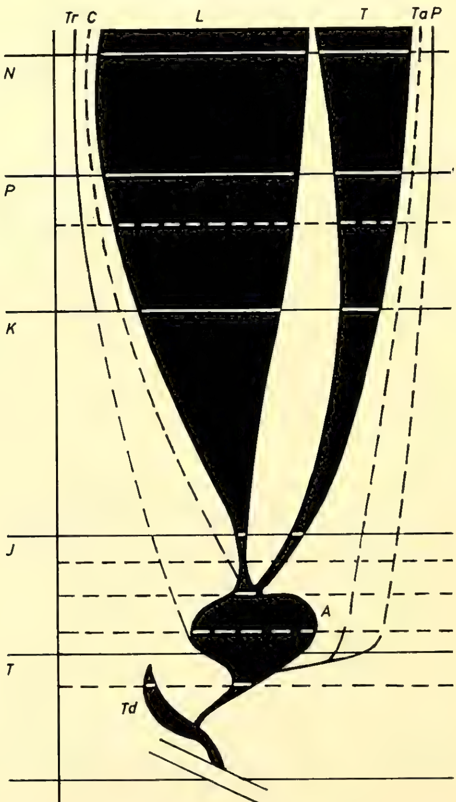


Abb. 2: Schema der phylogenetischen Beziehungen zwischen den Familien der Tipuloidea und ihren direkte Ahnen. Geochronologische Perioden: T - Trias; J - Jura; K - Kreide; P - Palaeogen; N - Neogen. Familien: Td - Tipulodictyidae; A - Architipulidae; Tr - Trichoceridae; C - Cylindrotomidae; L - Limoniidae; T - Tipulidae; Ta - Tanyderidae; P - Ptychopteridae. (Nach Rohdendorf).

rs in r_{2+3} und von dieser in r_2 und r_3 und auch die Verzweigung von r_{4+5} in r_4 und r_5, die für die Flügel der Tanyderidae kennzeichnend, aber bei allen rezenten Tipuloidea und insbesondere bei den Tipulidae nicht vorhanden ist, sind erhalten geblieben. Manche Limoniidae (z.B. die Pediciinae) haben als Larven noch eine normal entwickelte Kopfkapsel, die bei den Tipulidae immer primäre Reduktionsmerkmale zeigt.

Wahrscheinlich auf Grund dieser Tatsachen sieht Alexander (1920) die Tipulidae und auch die Cylindrotomidae als Seitenast an, der sich nicht direkt von den archaischen Tipuloidea abspaltet, sondern irgendwo an der Basis des genealogischen Stammes der Limoniidae. Hennig (1954) stellt die Hypothese auf, daß die Tipulidae mit bestimmten Gruppen der Limoniidae verwandt sind, eine Verwandschaft, die wahrscheinlich viel näher ist, als man heute allgemein annimmt.

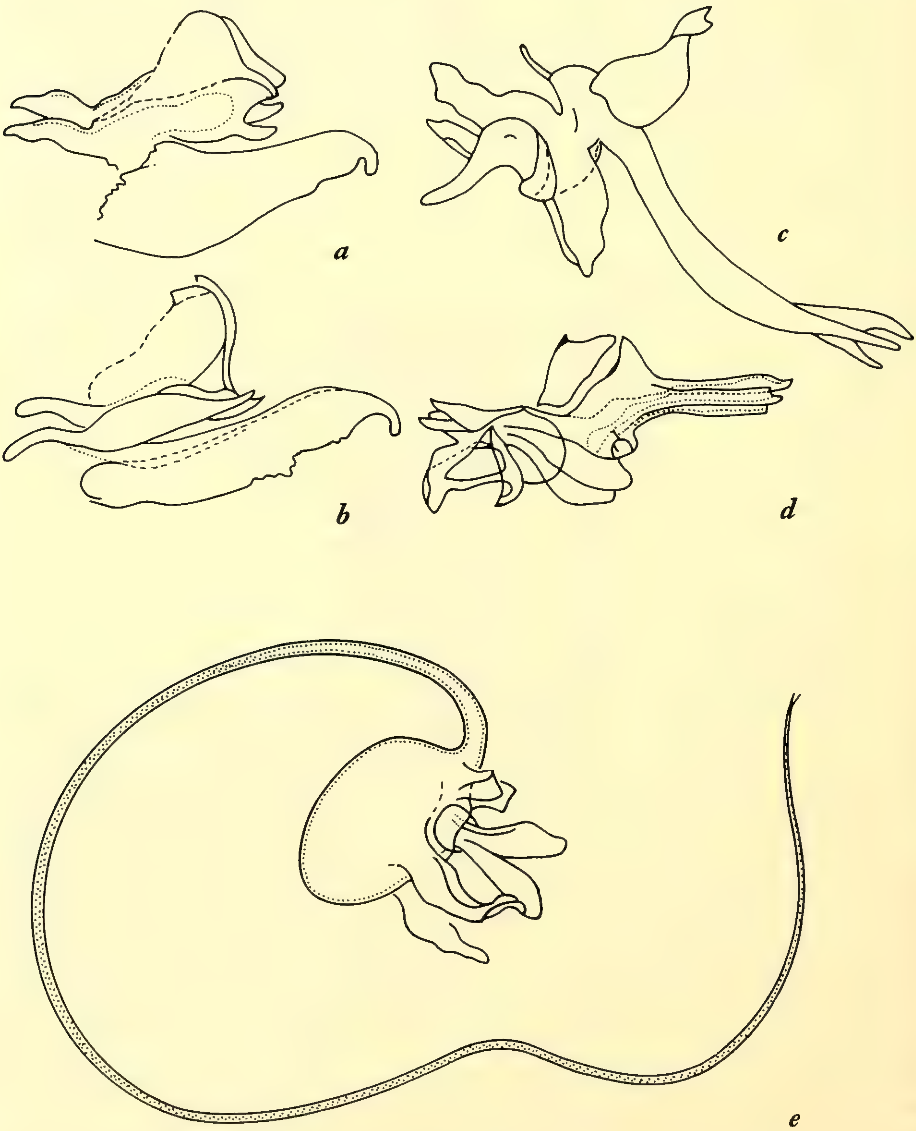
Die Verwandtschaft zwischen Tipulidae und Limoniidae zeigt sich aus zahlreichen vergleichend morphologischen Tatsachen. Es ist z.B. allgemein bekannt, daß die primitiven Dolichopezinae nach ihrem Bau den Limoniiden ähnlich sind. Nach Byers (1961) haben die Eilarven des primitiven Genus *Oropeza* fast denselben Bau des analen Segmentes wie die Larven der Limoniiden-Gattungen *Limnophila* und *Pseudolimnophila.* Bei den Larven der Tipulidae aus den tropischen Gattungen *Brachypremna* und *Megistocera* sind die Scheiden der Maxillarpalpen nicht hakenförmig gekrümmt wie bei fast allen Arten der anderen Gattungen dieser Familie, sondern gerade wie bei den Limoniidae. Diese und zahlreiche andere Tatsachen zeugen aber nicht so sehr für die Abstammung der Tipulidae von den Limoniidae, als vielmehr für gemeinsame Ahnen. Die wesentlichen Unterschiede zwischen Tipulidae und Limoniidae sind sicher nicht kleiner und auch nicht größer als ihre gemeinsamen Merkmale, wobei gerade die Unterscheidungsmerkmale für die Phylogenie wichtiger sind als die Übereinstimmungen.

Die Entwicklung dieser beiden Familien ist ganz verschieden. Die Tipulidae sind durch Anpassung nur Hygro-, Helo-, Geo- und Xylobionten geworden, während die Limoniidae, für die ein breiter ökologischer Bereich typisch ist, fast alle Möglichkeiten benützen, die die Umwelt ihnen bietet. Außer den obengenannten ökologischen Typen, die sie mit den Tipulidae gemeinsam haben, sind bei den Limoniidae auch die höchsten Formen ökologischer Spezialisation bekannt, wie Entwicklung in den höheren Formen der Pilze (Lindner, 1958a), in Blättern von lebenden Pflanzen (Swezy, 1915), im Boden mit Salzgehalt bis 16‰ (Slipka, 1959) und sogar im offenen Meer (Tokunaga, 1940). Als Resultat dieser breiten adaptiven Radiation ist wahrscheinlich einerseits die größere morphologische Verschiedenheit, anderseits die größere Artenzahl der Limoniidae in unserer heutigen Fauna, verglichen mit der Artenzahl der Tipulidae, zu deuten.

Im Gegensatz zu den Eiern der Tipulidae, die — von einigen Ausnahmen abgesehen — lackschwarz sind, mit strukturlosem Chorion und manchmal mit fadenförmigen Anhang, was bei keiner der anderen Familien der Tipuloidea vorkommt, sind die Eier bei den Limoniidae (Lindner, 1958) und auch bei den

Cylindrotomidae (Peus, 1952) fast immer hell gefärbt, halbdurchsichtig und haben oft ein netzförmiges Chorion, ererbt von den Panorpiden (Stitz, 1926).

Das anale Segment der Tipulidenlarven hat fast immer sechs fleischige Randlappen um das Stigmenfeld, bei den Limoniidae sind es nicht mehr als fünf. Phylogenetisch ist dies besonders wichtig, weil es darauf hinweist, daß im Larvenstadium, was die Struktur des Analsegmentes betrifft, die Tipulidae näher



. Abb. 3: Aedeagus von der Seite: *a, b* Limoniidae; *c, d* Cylindrotomidae (nach Peus); *e Tipula paludosa* Meigen.

dem Bibioniden-Typ stehen als den Limoniidae. Die Larven der Bibionidae haben im Analsegment ebenfalls sechs fleischige Fortsätze, die pleuralen nicht mitgerechnet (Theowald, 1957), und die Reduktion von sechs auf fünf ist zweifellos sekundär, was die direkte Abstammung der Tipulidae von den Limoniidae wenig wahrscheinlich macht.

Nach Edwards (1938) sind die männlichen Imagines der Tipulidae, was den Bau der inneren Geschlechtsorgane betrifft, sowohl von den Limoniidae als auch von den Cylindrotomidae verschieden; meistens wird dieser Tatsache nur wenig Aufmerksamkeit geschenkt, obwohl der Bau des Hypopygs von großer Wichtigkeit ist zur Feststellung von Verwandtschaften innerhalb die Familie Tipulidae. Bei den Tipulidae, *Prionocera* Loew ausgenommen, hat die Samenblase keine feste Verbindung mit dem Adminiculum und der fadenförmig gebogene Penis ist besonders lang und wächst von der Samenblase nach vorne (Abb. 3: e). Die Limoniidae und Cylindrotomidae aber haben eine feste Verbindung zwischen Samenblase und Adminiculum und einen verhältnismäßig kurzen Penis, der von der Samenblase nach hinten ragt (Abb. 3: a-d). Die Verbindung zwischen Samenblase und Adminiculum wird durch Parameren, die an den Apodema der Samenblase befestigt sind, bewerkstelligt, und nicht durch eine direkte Verbindung der Äste des Adminiculums an den Seiten der Samenblase wie in der Gattung *Prionocera* (Tjeder, 1948).

Nach interessanten Beobachtungen von White (1949) gibt es einen großen Unterschied zwischen Tipulidae und Limoniidae, was die Cytologie betrifft. Obwohl es keinen Zweifel gibt über den monophyletischen Ursprung der Tipuloidea, nehmen unter ihnen cytologisch die Limoniidae eine ganz eigene Stellung ein. Sie haben mehr gemeinsam mit den Culicidae und Psychodidae, während die anderen Tipuloidea — nach White — näher den neuropteroiden Ahnen der Zweiflügeligen stehen.

Es gibt deshalb nur wenige Tatsachen, auf Grund derer wir die Tipulidae als einen jüngeren und höher spezialisierten Ast der Limoniidae ansehen können; wohl aber müssen wir mit Hennig (1950) erkennen, daß die Tipulidae und die Limoniidae wahrscheinlich zwei Schwestergruppen sind, die einander an der Basis begegnen, d.h. an der Stelle, an der die Verzweigung ihres ancestralen gemeinschaftlichen genealogischen Stamms stattfand.

Im phylogenetischen Schema der Tipulidae (Abb. 2) läßt Rohdendorf (1964) die Tipulidae unabhängig von den Limoniidae und den Cylindrotomidae von den Architipulidae entstehen, obwohl die Ursprünge dieser drei Familien sich nah zusammen auf dem gemeinsamen Stamm befinden.

Die meisten Architipulidae aus der Ober-Trias und dem Jura haben sc am Ende nicht mit r_1 verbunden, sondern via sc_1 mit dem Flügelvorderrand; sc_2 war bei ihnen vermutlich gar nicht vorhanden, was für die Limoniidae charakteristisch ist, und zwar im Gegensatz zu den Tipulidae, die sc_2 immer haben aber nur selten überdies sc_1. Deshalb sind als Ahnen der Tipulidae nur einzelne Arten der Gattung *Architipula* Handlirsch möglich (z.B. *A. clara* Handlirsch aus dem Lias), die eine zweiästige sc hatten. Aber auch diese Arten underscheiden sich von den heutigen Tipulidae durch ein ziemlich spezialisiertes Flügelgeäder. Bei ihnen war z.B. die

Zelle M_1 schon gestielt, während von den rezenten Tipulidae die Gattungen *Nephrotoma* und *Nigrotipula* die primitivere ungestielte M_1, begrenzt durch m_1 und m_2 bewahrt haben.

Wahrscheinlich gibt es aber unter die Architipulidae auch noch andere nicht aufgefundene Formen, aus denen sich die Tipulidae entwickelt haben können.

Es gibt leider kein palaeontologisches Material, auf Grund dessen das geologische Alter der Tipulidae festgestellt werden kann. Die ältesten fossilen Arten dieser Familie wurden in Europa entdeckt, im Übergang von Eozän und Oligozän (Alexander, 1931; Theobald, 1937), aber schon in größerer Anzahl und ziemlich heterogen, was ihre Merkmale und systematische Stellung betrifft. In dieser Zeit war die Familie schon differenziert in Subfamilien und Gattungen, unter denen auch heutige vorhanden sind (z.B. *Tipula* von den palaearktischen und *Megistocera* und *Brachypremna* von den tropischen Gattungen). Aus dem ziemlich langsamen Evolutionstempo der systematischen Gruppen von höherem Rang und auch aus der Tatsache, daß sogar die Mehrzahl der heutigen Insektengattungen aus dem Palaeozän herstammen (Handlirsch, 1913, 1939) kann geschlossen werden, daß die Tipulidae aus dem Palaeozän das Resultat einer ziemlich langen historischen Entwicklung dieser Familie sind, die nicht nur den Anfang des Tertiär umfaßte, sondern auch einen beträchtlichen Teil des Mesozoikum. Auf mesozoisches Alter der Tipulidae weisen auch zoogeographische Tatsachen hin, insbesondere die fast universelle Verbreitung der Familie über die Welt und die Anwesenheit mancher ihrer Gattungen (z.B. *Dolichopeza*) in Australien, das zu Anfang des Känozoikums die Verbindung mit den anderen Kontinenten verlor. Das Nichtauffinden von Tipulidae in palaeontologischem Material aus Jura und Kreide stellt ihr mesozoisches Alter nicht in Frage, weil die fossile Dipteren-Fauna aus dem späten Mesozoikum noch kaum studiert worden ist.

Nach dem phylogenetischen System von Rohdendorf haben sich die Tipulidae nicht später als im Mittel-Jura (Dogger), vielleicht schon im Unter-Jura (Ober-Lias), entwickelt. Letzteres ist am wahrscheinlichsten. Wenn das stimmt, dann sind die Tipulidae schon wenigsten 160—170 Millionen Jahre alt.

Das Mittel-Jura mit humidem, ziemlich feuchtem undifferenziertem Klima und homogener Flora (Sinitzyn, 1962) war sehr geeignet für die Entwicklung und Verbreitung der archaischen Tipuliden über die Welt. Die archaischen Tipulidae, dendrophile und ziemlich hygrophile Insekten, haben damals wahrscheinlich die feuchten subtropischen und tropischen Wälder bevölkert; als Larven lebten sie wie ihre Ahnen der Familie Architipulidae an den Ufern von seichtem Wasser oder in amphibischen Umständen. Die sekundär bodenbewohnenden Arten, die in unserer heutigen Fauna den Großteil des Artenbestandes ausmachen (in Ukraine z.B. 74%), waren damals wahrscheinlich noch gar nicht vorhanden. Unter Berücksichtigung der palaeontologischen Funde aus dem Jura von Kara-Tau, in welcher Fauna die Nematocera 87% aller entdeckten zweiflügeligen Insekten sind, und unter denen die Tipuloidea eine der individuenreichsten Gruppen waren (Rohdendorf, 1947), kann man annehmen, daß die Tipulidae im Jura eine bedeutende Entwicklung erreicht haben.

Der Prozess des sekundären Übergangs der Tipulidae von hydro- und amphi-

bionter zu geobionter Lebensweise hat wahrscheinlich nicht vor Ende des Ober-Jura angefangen, als die humide Phase in der Erdgeschichte sich wieder in eine aride änderte; dieser Prozess dauerte während der ganzen Unter-Kreide, als auf der Erde eine aride Geokratie herrschte, die aber nicht so extrem war wie in der Mittel-Trias.

Es ist nicht unwahrscheinlich, daß gerade in der Kreide sich die wichtigsten der heutigen Formen der Tipulidae mit ihren sekundär amphibionten und geobionten Larven entwickelten. Die Änderung des ökologischen Milieus der Larven und im Zusammenhang damit ihre morphologischen Anpassungen — verursacht durch Ausbreitung des Festlandes und eine übereinstimmende Ausbreitung des Landklimas — fand nach Giljarow (1949) als Gefolge des Austrocknens der kleinen Wasserflächen und der seichten Stellen an den Ufern größerer Seen statt, wo sich vorher die archaischen Tipulidae entwickelten. Beim Übergang der Larven der Tipulidae, die bis heute das metapneustische Atmungssystem beibehalten haben, zum Bodenleben fand einerseits eine Reduktion des Haarsaums am Rande des Stigmenfeldes und damit parallel eine Reduktion der Analkiemen statt, anderseits eine Entwicklung zur Anpassung an das Bewegen in mehr oder weniger festem Substrat durch Bildung zum Teil sklerotisierter, größenmäßig differenzierter Randlappen um das Stigmenfeld.

Es soll bemerkt werden, daß der Übergang der Tipulidae zum Leben im Boden im Larvenstadium über eine amphibische Umwelt nicht der einzige Weg war, sondern nur einer von vielen in der Evolution zur terrestrischen Lebensweise im Mesozoikum. Einen anderen Weg, der wahrscheinlich auch bedeutungsvoll für die archaischen Tipulidae war, kann man sich so vorstellen: erst im gesättigten Moos im Wasser, dann zum Teil in etwas trockenerem Moos und zum Teil im Wasser, dann im Moos auf dem Lande, und schließlich im Boden. Die große Bedeutung der Moose einerseits in der Evolution der Landflora und anderseits in der Verbreitung vieler Wassertiere ist bekannt. Ein interessantes Beispiel dieser Evolutionsfolge geben die heutigen Arten der Untergattung *Savtshenkia*, in der alle Übergangsformen zu finden sind. Die Larven von *Tipula rufina* Meigen (Theowald, 1957) z.B. können direkt im Wasser leben, die Larven von *T. simulans* Savtshenko und *T. cheethami* Edwards leben in mit Wasser gesättigtem, untergetauchtem Moos, aber sie sind auch imstande, sich in sehr feuchten Landmoosen zu entwickeln. Die meisten *Savtshenkia*-Arten werden in mehr oder weniger feuchten Landmoosen gefunden, aber einige von ihnen, wie *alpium* Bergroth und *benesignata* Mannheims & Theowald können sich auch in ziemlich trockenem Moos entwickeln (Theowald, 1957; Savtshenko, 1963). Schließlich bevorzugen manche der höchstspezialisierten Arten wie *odontostyla* Savtshenko trockene Moose und leben auch unter Moos im Boden. Auch darin ist eine Tendenz zu sehen zum Übergang zu einer geobionten Lebensweise (Savtshenko, 1964a).

Gleichzeitig mit dem Entstehen der terrestrischen Larven haben sich als zweite Möglichkeit zur Lösung der Gegensätze zwischen Hygrophilie der Familie und Aridisation der Umwelt in der Unter-Kreide die xylobionten Familiengruppen entwickelt, die in faulendem Holz leben. Auf den ersten Blick scheint es naheliegend, daß die xylobionten Arten sich aus den terrestrischen entwickelt haben,

weil es keinen prinzipiellen Unterschied gibt zwischen den letzteren und den xylobionten, was ihre trophischen Bindungen betrifft (Brauns, 1953). Das Vorhandensein eines rudimentären Haarsaums um das Stigmenfeld bei den Larven der ziemlich archaischen xylobionten *Ctenophora*-Arten aber weist darauf hin, daß ihre Ahnen nicht im Boden gelebt haben, sondern amphibisch waren oder sogar im Wasser lebten. Es ist möglich, daß die Geokratie der Unteren Kreide infolge des schnellen Austrocknens von kleinen Wasserflächen — in denen sich die Larven der archaischen Tipulidae entwickelten — diese zum Teil zwang, sich nicht nur an neue Lebensumstände im Boden anzupassen, sondern auch nach anderen lokalen Überlebenszonen zu suchen, wie Mikro-Wasserbehältern, die in den Höhlen von Bäumen in tropischen und subtropischen Wäldern entstanden (Rohnert, 1950). Es ist bekannt, daß sich in solchen Behältern eine interessante Fauna entwickelt, zu der auch Tipulidae gehören. Anfangs suchten die archaischen hydrobionten Tipulidae Versteck gegen Hitze und Feuchtigkeitsmangel, versteckten sich in Baumhöhlen und fingen dort mit dem Ablegen der Eier in Wasserbehälter an, in denen sich dann die normale postembryonale Entwicklung vollzog. Mit Zunahme der Aridisation der Umgebung trockneten die Behälter in den trockenen Perioden wahrscheinlich schnell aus, wodurch die Larven der Tipulidae trocken lagen, bevor sie sich verpuppten. Die Jüngeren von ihnen starben, die Entwicklung der Älteren jedoch ging weiter, weil die Reste der Pflanzen, die in den Baumhöhlen waren, noch einige Zeit feucht blieben. So wurden die hydrobionten Formen allmählich saproxylobiont, wobei sich dieser Prozess in ökologischer Hinsicht kaum vom Evolutionsprozess der terrestrischen Formen dieser Familie unterschied.

Die Bildung mancher geo- und saproxylobionter Gruppen dieser Familie in der Kreide-Zeit ist gesichert durch systematische und zoogeographische Evidenz, insbesondere durch das Vorkommen der gleichen Formen einerseits in jenen systematischen Gruppen von Tipulidae, deren Verbreitung auf mesozoisches Alter deutet (*Dolichopeza* und einige orientalische Ctenophorinae), anderseits bei den Tipulidae von Südostasien, wo sich die Fauna im Mesozoikum kaum änderte.

Die Blütezeit der Tipulidae war in der ersten Hälfte des Tertiär, als in der Landfauna die Nematocera allmählich von den Brachycera ersetzt wurden. Im Ober-Eozän wie auch im Oligozän von Europa gab es ziemlich viele Arten, die hauptsächlich zu rezenten Gattungen gehörten (Alexander, 1931; Theobald, 1937). Außer den ausgestorbenen Gruppen der Gattung *Tipula* (*Electrotipula* und andere) waren im Paläogen wahrscheinlich auch schon Untergattungen da, die heute zur Fauna von Südostasiens zählen (Savtshenko, 1961).

Im Paläogen hat die Familie der Tipulidae ihre primär hygrophilen Merkmale beibehalten. Am Ende des Paläogens, im Ober-Oligozän von Zentraleuropa zum Beispiel, waren die Biotope, in denen die meisten Tipuliden lebten, die Gegenden mit feuchten moorartigen Wäldern oder Sträuchern (Statz, 1943—1944).

Wichtige Änderungen, was die weitere ökologische Spezialisation anlangt, gab es im Neogen, insbesondere am Ende des Miozäns und im Pliozän, als in den gemäßigten Breiten von Eurasien Abkühlung und insbesondere Aridisation des Klimas (Ekman, 1935; Wulf, 1944) Hauptfaktoren der Evolution waren. Seit der

zweiten Hälfte des Neogen entwickelten sich die Anpassungen der Tipulidae, wie die aller Tipuloidea (Peus, 1952), beim Übergang von feuchten zu trockenen Lebensumständen und anschließend daran ihre ökologische Spezialisation dergestalt, daß sie allmählich unabhängig von der Feuchtigkeit ihrer Umwelt wurden.

Resultat davon war einerseits eine erhebliche Verarmung der Familie — ihr Anteil an der heutigen Fauna z.B. ist nur etwa 3.9% (etwa 3200 Arten) der Gesamtanzahl der heute bekannte Diptera (81.000 Arten) — anderseits entstand in der Familie eine Reihe spezialisierter Gruppen von meso- und xerophilem Typus auf Kosten der hygrophilen, helobionten und geobionten Gruppen. Wie zoogeograpische Tatsachen zeigen, haben sich fast alle mehr oder weniger trockenheitsliebenden systematischen Gruppen der Tipulidae, zu denen zum Beispiel die Untergattungen *Pterelachisus, Oreomyza, Vestiplex, Lunatipula* und *Odonatisca* der Gattung *Tipula* gehören, gerade während des Neogen zu eigenen Taxa entwickelt, und manche von ihnen, wie *Lunatipula,* erreichten ihren größte Blütezeit erst am Ende des Tertiär oder vielleicht noch später, als nicht nur alle rezenten Untergattungen, sondern auch schon eine Reihe von rezenten Arten der Tipulidae vorkamen (Savtshenko, 1961, 1964).

Es ist interessant, daß während des Tertiär und des Quartär, die zusammen mehr als 150 Millionen Jahren währten, die Tipulidae sich verhältnismäßig wenig differenzierten und morphologisch veränderten, ausgenommen eine Anzahl unbedeutender Merkmale, die in Imago oder Larve als Anpassungen an das Leben in mehr oder weniger ariden Umständen entstanden. Dies deutet auf großen Konservativismus, auf langsames Tempo und auf Einseitigkeit der Evolution der Tipulidae hin, wahrscheinlich allgemeine Merkmale für die Mehrzahl von archaischen und geologisch älteren Gruppen von Organismen. Es gibt aber auch Grund zur Vermutung, daß die Tipulidae, wie alle Tipuloidea (Rohdendorf, 1947) eine Restgruppe der Diptera sind, die sich mit Ausnahme von stark spezialisierten Gattungen und Untergattungen heute in einem Zustand von Regression und allmählichem Aussterben befinden. Darauf weist auch das Vorkommen einer verhältnismäßig großen Anzahl von systematisch stark isolierten kleine Gattungen mit sehr beschränktem Verbreitungsgebiet innerhald der Familie Tipulidae — in gemäßigten wie in tropischen Zonen unserer Erdkugel — hin. Es verdient Beachtung, daß die höchstspezialisierten xerophilen Untergattungen, die sich am besten an die heutigen Lebensumstände angepaßt haben, heute die systematisch meist differenzierten und artenreichsten Gruppen sind (*Vestiplex, Lunatipula*). Das Beispiel der Tipulidae deutet darauf hin daß die Regel von Roz über progressive Reduktion der Veränderlichkeit, nach der das Evolutionspotential der Organismen mit dem Niveau ihrer Spezialisation nicht wächst, sondern absinkt, nicht in allen Fällen stimmt.

INFRAFAMILIÄRE PHYLOGENETISCHE BEZIEHUNGEN

Die Verhältnisse innerhalb der Familie Tipulidae sind noch nicht klar. Edwards (1926) — betreffend die Phylogenie der Nematocera — glaubt, daß die hydrobionten Nematocera sich aus den geo- und xylobionten entwickelt haben. Diese Ansicht wird von ihm gestützt auf die Tatsache, daß die verhältnismäßig wenigen

Gruppen von hydrobionten Formen unter den Nematocera meistens Merkmale hoher Spezialisation zeigen, während die weniger spezialisierten Formen sich in humusreichem Boden oder in faulendem Holz entwickeln.

Diese betreffend die Nematocera von Edwards unterstützte Annahme kann nicht als Ausgangspunkt dienen zur Analyse der phylogenetischen Verhältnisse der Tipulidae, weil sie mit vergleichend morphologischer Evidenz und auch mit der Entwicklungsgeschichte der Familie im Widerspruch steht. Die Tatsache, daß alle Tipulidae ohne Ausnahme, ungeachtet ihrer ökologischen Spezialisation, im Larvenstadium metapneustisch sind und außerdem die bei ihnen herrschende Tendenz in der Evolution von humiden zu ariden Lebensumständen deuten darauf hin, daß zu den weniger-spezialisierten und deshalb zu den Urformen in der Familie nicht die geo- und xylobionten sondern die hydro- und helobionten gehören. Dies schließt nicht aus, daß manche heutige hydro- und helobionte Gruppen dieser Familie nicht nur wenigspezialisierte sondern auch hochspezialisierte Merkmale haben, und daß im Gegensatz dazu die geo- und xylobionten Formen auch wenigspezialisierte Merkmale zeigen können. Das kommt, weil die Evolution bei den verschiedenen Gruppen in dieser Familie sich erstens ungleichmäßig und in ungleichem Tempo vollzog und zweitens nicht geradlinig sondern nach dem Typ der dichotomen Verzweigung der Taxa.

Auf Grund eines Vergleichs der Gruppen der Tipulidae untereinander und auch auf Grund von Vergleichen mit ihren panorpiden- und bibioniden-ähnlichen Ahnen können nachfolgende plesiomorphen und apomorphen Merkmale aufgestellt werden. Die Terminologie plesiomorph und apomorph wird benutzt nach den Auffassungen von Hennig (1950).

Merkmale

Plesiomorph		Apomorph
	Ei	
Länglich		Kurz, manchmal kugel- oder linsenförmig
Netzartiges Chorion		Strukturloses Chorion
Kein Eifilament		Eifilament vorhanden
	Larve	
Dorsal mit dunklen Streifen oder Flecken.		Dorsal einfarbig.
Fingerförmige, undifferenzierte und beiderseits nur schwach sklerotisierte dorsale und laterale Randlappen um das Stigmenfeld.		Länglich konische, differenzierte und mehr oder weniger sklerotisierte (manchmal zu Stacheln modifizierte) dorsale und laterale Randlappen um das Stigmenfeld.
Ein Haarsaum am Rande des Stigmenfeldes.		Kein Haarsaum am Rande des Stigmenfeldes.
Analkiemen vorhanden.		Keine Analkiemen.

(Merkmale)

(Plesiomorph)	(Apomorph)
Deutliche Ausstülpungen um die Analöffnung.	Kaum oder keine Ausstülpungen um die Analöffnung.
Zweites und drittes Makrochaet links und rechts am Hinterrand der abdominalen Tergite nah zusammen.	Zweites und drittes Makrochaet links und rechts am Hinterrand der abdominalen Tergite weit auseinander.
Puppe	
Ziemlich viele kleine Dörnchen an den Hinterrändern der letzten abdominalen Sternite.	Eine konstante Zahl von größeren Dornen an den Hinterrändern der abdominalen Sternite.
Imago	
Ozellen rudimentär.	Ozellen fehlen.
Geißel der Antennen mit zylinderförmigen Gliedern oder gesägt.	Geißelglieder an der Basis verdickt oder kammförmig verzweigt.
Flügelfläche mit Mikrotrichien.	Flügelfläche nackt.
Ader sc_1 und/oder überzählige Querader anwesend.	Keine Ader sc_1 und keine überzählige Querader.
Flügel quergestreift oder gefleckt.	Flügel einfarbig.
Zelle M_1 ungestielt.	Zelle M_1 gestielt oder die Adern m_1 und m_2 verschmolzen.
Lange dünne fadenförmige Beine.	Beine kürzer und dicker.
Beim Männchen sind 9. Tergit und 9. Sternit deutlich getrennt.	Beim Männchen sind 9. Tergit und 9. Sternit ohne Naht ringförmig miteinander verschmolzen.
Deutlich differenzierter Basistylus.	Basistylus undeutlich oder reduziert.
Id einfach gebaut.	Id kompliziert gebaut.
8. Sternit beim Männchen undifferenziert.	8. Sternit beim Männchen kompliziert gebaut mit Anhängen oder Ausstülpungen.
Langgestreckter sklerotisierter Ovipositor mit deutlich entwickelten Hypovalven.	Verkürzter fleischiger Ovipositor mit reduzierten Hypovalven.
9. Tergit beim Weibchen normal entwickelt.	9. Tergit beim Weibchen reduziert.

(Plesiomorph)	(Apomorph)
Biologie	
Hydro- und hygrophile Arten.	Meso- und xerophile Arten.
Die Eier werden einzeln oder in Klumpen abgelegt.	Viele Eier werden zusammen in tieferen Bodenschichten abgesetzt.
Die Larven entwickeln sich im Wasser oder in mit Wasser gesättigtem Boden (Moorgebiete, feuchtes Moos).	Die Larven entwickeln sich in trockenerem Boden oder in faulendem Holz.
Die Larven ernähren sich von faulenden organischen Stoffen oder von Moos.	Die Larven ernähren sich von lebenden höheren Pflanzen.
Der Entwicklungszyklus ist bivoltin oder polyvoltin.	Der Entwicklungszyklus ist monovoltin.
Entwicklung ohne Diapause.	Entwicklung mit Diapause.

Bemerkung: In Anbetracht der Tatsache, daß bei den Larven der Bibionidae die dorsalen und lateralen Randlappen um das Stigmenfeld auch länglich-konisch sind, glaubt Theowald (1957), daß diese Form bei den Tipulidae die primitivste darstellt. Ich bin damit nicht einverstanden, weil die Form dieser Randlappen bei den primären Bodenlarven der Bibionidae und den sekundären Bodenlarven der Tipulidae nicht homolog sondern analog entstanden ist. Sie sind konvergent entstanden als Anpassung an gleichartige Lebensumstände in einem dichten Substrat.

Die meisten plesiomorphen Merkmale haben die Dolichopezinae, zu denen in unserer Fauna die Gattung *Dolichopeza* gehört. In dieser Tribus findet bei den Arten der Gattung *Megistocera* Wiedemann (tropisch) die ganze praeimaginale Entwicklung im Wasser statt (Rogers, 1949). Die hygromorphen Larven von *Megistocera* haben das Stigmenfeld am primitivsten gebaut, was sie vielleicht noch von den archaischen Tipulidae aus dem Mesozoikum geerbt haben. Stigmenfeld und Randlappen sind mit langen Haaren gesäumt. Die Flügel sind mit Mikrotrichien bedeckt, wodurch sie gegen das naßwerden geschützt sind. Die starke Beziehung zum Wassermilieu bei *Megistocera* wird auch aus der Tatsache sichtbar, daß die Weibchen zum Absetzen der Eier und auch zur Ruhe auf der Wasseroberfläche sitzen können, wobei sie sich mit den außerordentlich langen Beinen stützen.

Als meist plesiomorphe Tribus der Familie haben die Dolichopezinae sehr viele Merkmale mit den Limoniidae gemeinsam, was sich bei manchen von ihnen im Bau des analen Segmentes der Eilarven, in den geraden statt hakenförmig gekrümmten Scheiden der Maxillarpalpen, im ziemlich einfachen Bau des Hypopygs der Männchen und bei vielen Gattungen auch im Vorhandensein einer normal entwickelten sc_1 zeigt.

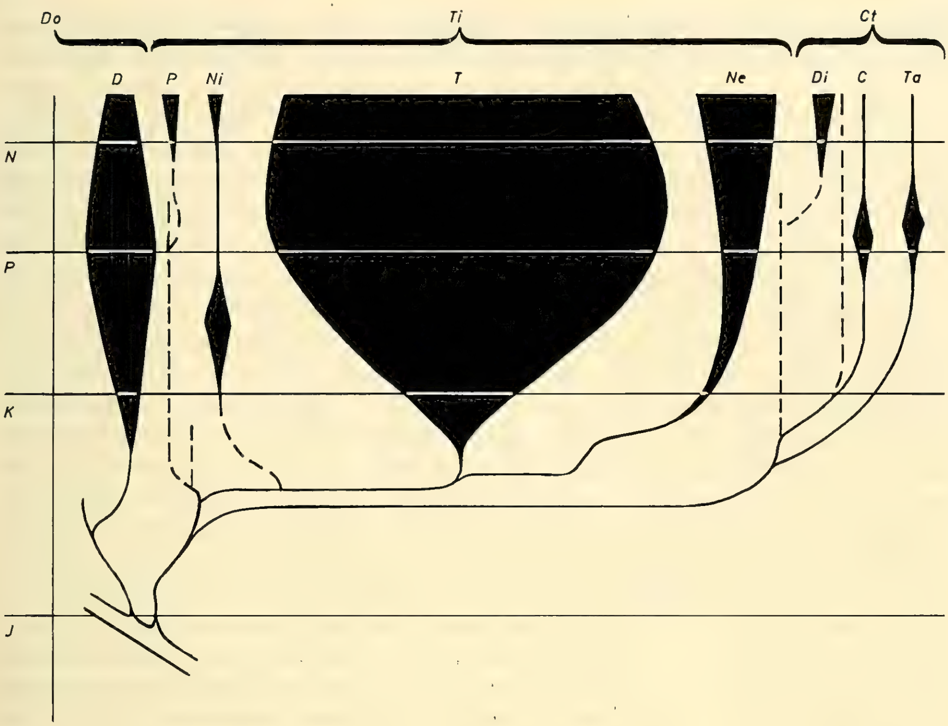


Abb. 4: Hypothetisches Schema der phylogenetischen Verhältnisse zwischen den Unterfamilien und Gattungen der Tipulidae: Die Namen der Perioden sind wie in Abb. 3 abgekürzt. Unterfamilien: Do - Dolichopezinae; Ti - Tipulinae; Ct - Ctenophorinae. Gattungen: D - *Dolichopeza;* P - *Prionocera;* Ni - *Nigrotipula*; T - *Tipula;* Ne - *Nephrotoma;* Di - *Dictenidia;* C - *Ctenophora;* Ta - *Tanyptera.*

Die zu unserer Fauna zählende Gattung *Dolichopeza* gehört nicht zu den primitiven, sondern zu den mehr apomorphen Gruppen der Dolichopezinae; sie zweigte irgendwann um Mitte Kreide ab und spezialisierte sich mehr in Richtung Anpassen an aridere Umstände. Die larvale Entwicklung findet nicht mehr im Wasser, sondern in feuchten Landmoosen statt. Die Larven haben längliche, fast konische Randlappen und einen kurzen Haarsaum um das Stigmenfeld und verhältnismäßig kurze Analkiemen und zeigen den apomorphen Typ der Chaetotaxie; die Puppen haben kurze, am Ende gebogene Mesothorakal-Hörner, wie sie bei den meisten Tipulidae vorkommen, und die Imago hat eine offene Diskoidalzelle durch teilweise reduzierte m_3. In vielen Fällen unterscheidet sich *Dolichopeza* sogar durch eine größere Apomorphie von manchen anderen Gattungen der Tipulidae in unserem Faunengebiet, was die Möglichkeit einer direkten phylogenetischen Verbindung mit ihnen ausschließt (Abb. 4).

Ziemlich nah verwandt mit den primitiven Dolichopezinae ist die Gattung *Prionocera* der Tipulidae. Die Larven leben an den Wurzeln von Wasserpflanzen (Theowald, 1957) oder im Wasser (Nielsen, 1954). Der Bau ihres analen Segmentes ist ebenso plesiomorph wie in der Gattung *Megistocera.* Die Puppen haben an den

Hinterrändern der abdominalen Segmente viele kleine Dörnchen, die charakteristisch sind für die plesiomorphen Formen der Tipulidae, und die Imago hat rudimentäre Ozellen und ein ganz einfach gebautes Hypopyg (Tjeder, 1948). Damit erinnert sie an die Dolichopezinae und auch an die Limoniidae. Die Imagines haben aber auch apomorphe Merkmale. Sie haben zum Beispiel die für die anderen Tipulinae typische Flügeladerung. Manche anderen Merkmale wie die dunkle Färbung und die Behaarung des Leibes, die Entwicklung in moorigen Biotopen des nördlichen Typs und die Verbreitung überwiegend in höheren Breiten, wo die Fauna noch ziemlich jung ist, deuten auf verhältnismäßig hohe Apomorphie der Gattung *Prionocera*, die wahrscheinlich nicht vor dem Ende des Neogen entstand und möglicherweise erst im Pleistocän ihre Blütezeit erreichte. Eine derartige Kombination von plesiomorphen und apomorphen Merkmalen bei *Prionocera* muß als Nachweis gedeutet werden, daß diese Gattung phylogenetisch mit einer sehr alten und primitiven, den Dolichopezinae nah verwandten Gruppe dieser Familie, die schon in der Kreide von ihnen abzweigte, verbunden ist; sie war schon im Palaeogen ein ganz unabhängiger Zweig und starb am Anfang des Neogen aus, als eine neue geokrate Phase in der Erdgeschichte anfing. Es blieb nur ein kleiner spezialisierter Seitenzweig übrig (Abb. 4), der sich zur Gattung *Prionocera*, angepaßt an das Leben im kalten nordborealen Klima, entwickelte.

Von den primitiven Gruppen der Dolichopezinae zweigten wahrscheinlich schon in der Kreide die ancestralen Formen der anderen Gattungen der Tipulinae unseres Faunengebiets ab, wie die Ahnen von *Nigrotipula*, *Tipula* und *Nephrotoma*, die zusammen einen ziemlich natürlichen genetischen Komplex bilden.

Die Gattung *Nigrotipula* hat bei den Larven plesiomorphe und apomorphe Merkmale. Plesiomorph ist zum Beispiel bei den Larven das Vorhandensein eines reduzierten Haarsaums am Unterrand des Stigmenfeldes; apomorph sind das Fehlen einer hydro- oder hygromorphen Anpassung und die geobionte Lebensweise. Die Imago hat noch eine ziemlich plesiomorphe Flügeladerung, für die eine ungestielte oder nur kurz gestielte Zelle M_1 kennzeichnend ist; das Hypopyg ist ganz einfach gebaut. All dies deutet darauf hin, daß der Ursprung dieser Gattung in der Nähe einer primitiven alten Gruppe der Tipulinae, die wahrscheinlich noch helobionte Larven hatte, zu suchen ist. Es ist interessant zu wissen, daß die *Nigrotipula*-Arten die gleiche Kombination einer Reihe von Merkmalen haben wie die Gattungen *Tipula* und *Nephrotoma*. Mit der ersteren haben sie die Lage von sc_2 im Bezug auf die Basis von rs, die Anzahl von tibialen Spornen (1-2-2) und den Bau des Prothorax der Larven gemeinsam, mit *Nephrotoma* die kurze Schnauze, eine ungestielte Zelle M_1, den mit mikroskopischen Dörnchen versehenen Einschnitt am Hinterrand des 9. Tergits bei den Männchen und die Anzahl der Dornen an den Hinterrändern der abdominalen Tergite bei der Puppe. Es muß deshalb angenommen werden, daß die ancestralen Formen, aus denen sich die Gattung *Nigrotipula* entwickelt hat, vom gemeinsamen Stamm der Tipulinae vor dem Divergieren in die Gattungen *Tipula* und *Nephrotoma* abzweigten und auch, daß diese ancestralen Formen, die schon lange ausgestorben sind, keine apomorphen Merkmale hatten, wie sie später während des Anpassungsprozesses der Annahme einer geobionten

Lebensweise gegenüber einer Änderung der palaeogenen Sumpfmoore im Torfboden in der Gattung *Nigrotipula* entstanden sind.

Über den monophyletischen Ursprung der Gattungen *Tipula* und *Nephrotoma*, die soviele Merkmale mit den Dolichopezinae, aber auch untereinander gemeinsam haben, gibt es keinen Zweifel. Gemeinsam sind für sie sogar Merkmale wie der Typ der Körperfärbung und die Stelle der Abzweigung der Ader r_1, beides spezifisch für beide Gattungen. Der lackglänzende Thorax ist nicht nur charakteristisch für die Gattung *Nephrotoma*, sondern auch für manche auf Grund anderer Merkmale in die Gattung *Tipula* gehörende Arten, zum Beispiel die in die palaearktische Untergattung *Dendrotipula* gehörende nordchinesische *T. hoi* Alexander und insbesondere für die Arten der nearktischen Untergattungen *Nephrotomodes* und *Nobilitipula*. Die Stelle des Verzweigungspunktes der Ader m_{3+4} an der Basis der Diskoidalzelle ist nicht auf die Gattung *Tipula* beschränkt, sondern kommt ausnahmsweise auch bei manchen charakteristischen Arten der Gattung *Nephrotoma* vor (Edwards, 1928).

Die Gattung *Tipula* zweigte wahrscheinlich in der Kreide vom Hauptstamm der Tipulinae und später, irgendwann am Ende des Palaeogens oder am Anfang des Neogens, erreichte sie ihre größte Polymorphie und Differenzierung (Abb. 4). Obwohl das Genus *Nephrotoma* denselben Ursprung hat wie die Gattung *Tipula*, zweigte es wahrscheinlich nicht am Ende des Mesozoikums oder am Anfang des Palaeogen direkt von *Tipula* ab, sondern von irgendeiner mehr plesiomorphen ausgestorbenen Zwischengruppe der Tipulinae, die wahrscheinlich nahe verwandt war mit der von Alexander (1931) beschriebenen Untergattung *Electrotipula*, gefunden im baltischen Bernstein, deren einzige bekannte Art (*E. pinetorum* Alexander) im Flügelgeäder Merkmale sowohl von *Tipula* und als auch von *Nephrotoma* zeigt.

Obwohl *Nephrotoma* einen ziemlich hohen Grad von ökologischer Spezialisation erreichte, erlangte diese geobionte Gattung nicht den Umfang und den Grad der Differenzierung der Gattung *Tipula*; dies kann einerseits durch das jüngere geologische Alter, anderseits durch den engeren ökologischen Bereich ihrer Anpassungen bedingt sein. Das fast völlige Fehlen von Fossilien, die zur Gattung *Nephrotoma* gehören, ist wohl ein Hinweis darauf, daß in der Vergangenheit diese Gattung nie artenreich war und wahrscheinlich nie eine derartige Blütezeit erreichte wie in unserer heutigen Fauna.

Die einheimischen Gattungen *Ctenophora* und *Tanyptera*, die ein natürlicher Komplex von Arten mit gekämmten Geißelgliedern sind, sind innerhalb dieser Familie durch die höchste ökologische Spezialisation gekennzeichnet: ihre Larven sind saproxylobiont, die der *Tanyptera*-Arten sogar fakultativ xylobiont. Im imaginalen Stadium sind diese Gattungen überwiegend apomorph. In der Gattung *Ctenophora* zum Beispiel ist der Bau der id sehr kompliziert apomorph und bei den spezialisierten Arten der Gattung *Tanyptera* sogar das ganze Hypopyg. Gleichzeitig zeigen die Arten dieser Genera auch viele plesiomorphe Merkmale: kurze Schnauze, oft ungestielte oder kurzgestielte Zelle M_1 und einen ziemlich primitiv gebauten Basistylus als Imagines, außerdem als Larven und Puppen einen primitiven Typ von Chaetotaxie. Phylogenetisch hat ein plesiomorphes Merkmal

wie das Vorhandensein eines Haarsaums um das Stigmenfeld bei den Larven von *Ctenophora* große Bedeutung. Es deutet darauf hin, daß die Gattung *Ctenophora* und damit alle nah miteinander verwandten Ctenophorinae, nicht von den apomorphen geobionten, sondern von den plesiomorphen helobionten Gruppen dieser Familie abzweigten. Es ist wahrscheinlicher, daß sich die Ctenophorinae aus einer primitiven amphibischen oder sogar aus einer im Wasser lebenden ancestralen Form entwickelt haben, die im Mesozoikum von den Dolichopezinae abzweigte und sich später sowohl zu Tipulinae als auch zu Ctenophorinae entwickelte (Abb. 4).

Die frühesten archaischen Ctenophorinae hatten wahrscheinlich — wie die heutigen Arten der Gattung *Dictenidia* — an der Basis und am Ende jedes Geißelgliedes Fortsätze, die sich aus den proximalen und distalen Verdickungen dieser Segmente, die kennzeichnend sind für viele Tipulidae, entwickelt haben. Es gab dabei eine Verschiebung eines Teiles der Wirtelhaare zum Ende des unteren Fortsatzes. Im weiteren Evolutionsprozess, in dem die Geißelglieder durch Spaltung eines oder beider Fortsätze komplizierter wurden, entstanden die Formen mit drei (*Tanyptera*) oder vier (*Ctenophora*) Fortsätzen an jedem Geißelglied.

Am meisten plesiomorph und wahrscheinlich am ältesten unter den Ctenophorinae unseres Faunengebietes ist aber doch wohl die Gattung *Ctenophora* und nicht die Gattung *Dictenidia*. Es gibt keinen Zweifel, daß *Ctenophora* irgendwo in den gemäßigten Teilen von Ostasien zu Ende des Mesozoikums oder am Anfang des Tertiär als unabhängiges Taxon abzweigte. Was die Gattung *Dictenidia* betrifft, sie war wahrscheinlich ein "Seitenast" einer anderen mehr plesiomorphen, später jedoch ausgestorbenen Gruppe der Ctenophorinae; sie zweigte von dieser Gruppe bedeutend später ab, wahrscheinlich erst Ende Palaeogen oder Anfang Neogen. *Tanyptera* zweigte wohl von derselben ausgestorbenen Gruppe ab, aber nicht später als in Palaeogen. Was die Spezialisation in den Entwicklungsstadien anlangt, hat *Tanyptera* sich aber deutlich weiter entwickelt als die anderen Gattungen. Im Larvenstadium, in dem *Tanyptera* habituell an die Larven von Bockkäfern erinnert, hat sie sich nicht nur an das Leben in weichem faulendem Holz angepaßt, sondern auch an das Leben in hartem Holz.

Die phylogenetischen Beziehungen zwischen den Artengruppen innerhalb der Gattungen der Tipulidae sind noch nicht klar. Die Gattung *Dolichopeza* hat in unserem Faunengebiet (Ukraine) nur eine ziemlich spezialisierte Art. Die Männchen dieser Art haben ein Adminiculum ohne stabförmige Verbindungen mit der Vesica. Diese Verbindungen kommen noch wenig entwickelt vor bei der nearktischen *D. americana* Needham und in schon ganz gut entwickelter Form bei manchen Arten der Untergattung *Oropeza*, die für die Fauna von Ostasien und Nordamerika charakteristisch ist (Byers, 1961).

Die meisten der ukrainischen *Prionocera*-Arten, die nur wenig deutlich gesägte Antennen und einen ziemlich stark behaarten Körper haben, sind wahrscheinlich ziemlich plesiomorph und damit ziemlicht alt.

Die einzige ukrainische Art der Gattung *Nigrotipula* ist ziemlich apomorph. Sie hat eine dunkle Färbung, die bei den Tipuliden sekundär ist, und einen kom-

plizierten und spezialisierten Bau der id. Bei den verwandten Arten aus dem Norden von Ostasien ist die Körperfärbung meistens braungelb und die id sind einfacher gebaut.

Innerhalb der Gattung *Tipula* (Abb. 5) ist die Untergattung *Platytipula* wohl am meisten plesiomorph. Die Flügelzeichnung und der Bau des Hypopygs erinnern an die Dolichopezinae. Alexander (1926) meint, daß manche ostasiatischen Arten dieser Untergattung, die sich vermutlich schon in der Kreide als unabhängiges Taxon differenzierten (Savtshenko, 1961), direkt mit den Dolichopezinae verwandt sind.

Als ziemlich apomorphe und junge Abzweigung der Untergattung *Platytipula* oder einer mit ihr nahverwandten ausgestorbener Untergattung muß man wohl *Schummelia* ansehen, die sich wohl nicht später als im Eozän entwickelt haben dürfte. Flügeladerung und Eigentümlichkeiten im Bau des Hypopygs weisen auf eine Verwandtschaft von *Platytipula* und *Schummelia* hin.

Die Untergattungen *Acutipula, Yamatotipula* und *Tipula* s.str. stammen von den archaischen Zweigen der Gattung *Tipula.* Sie bilden zusammen einen genetischen Komplex, der nach Theowald (1957) den Rang einer Gattung verdient. Sie sind durch eine Reihe von plesiomorphen Merkmalen charakterisiert, zum Beispiel durch helobionte und fakultativ hydrobionte oder ihnen sehr ähnliche primitive geobionte Larven. Die Untergattung *Acutipula* ist die primitivste und älteste von ihnen, sie stammt wohl aus dem Palaeogen. Von gemeinsamen ancestralen Formen und parallel mit ihr entwickelte sich seit dem Oligozän die Untergattung *Yamatotipula.* Und im Miozän zweigte vermutlich von *Acutipula* die Untergattung

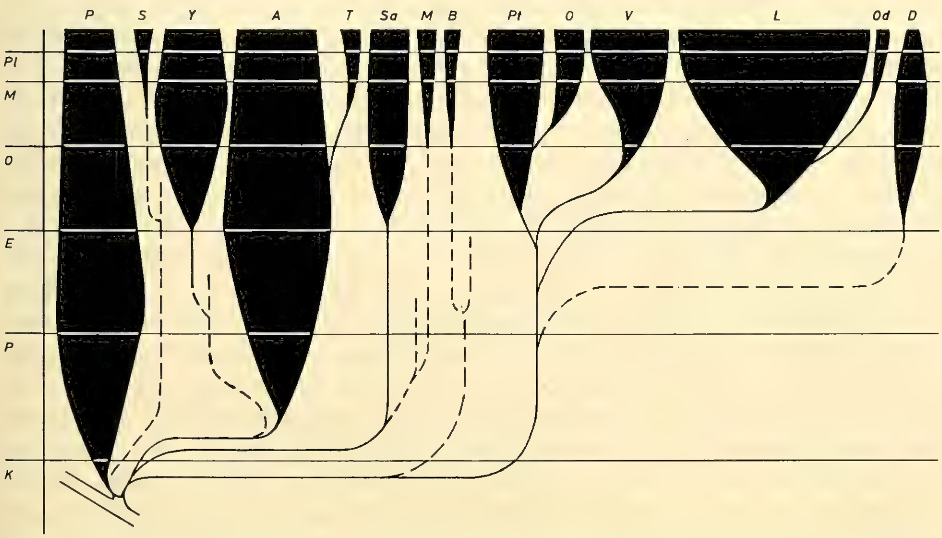


Abb. 5: Hypothetisches Schema der phylogenetischen Verhältnisse zwischen den Untergattungen der Gattung *Tipula.* Geochronologische Perioden: K - Kreide; P - Palaeozän; E - Eozän; O - Oligozän; M - Miozän; Pl - Pliozän. Untergattungen: P - *Platytipula;* S - *Schummelia;* Y - *Yamatotipula;* A - *Acutipula;* T - *Tipula* s.str.; Sa - *Savtshenkia;* M - *Mediotipula;* B - *Beringotipula;* Pt - *Pterelachisus;* O - *Oreomyza;* V - *Vestiplex;* L - *Lunatipula;* Od - *Odonatisca;* D - *Dendrotipula.*

Tipula s.str. ab, die in diesem Komplex wohl am meisten apomorph ist (Savtshenko, 1961). Alle Untergattungen dieses Komplexes haben nicht nur einen ähnlichen Bau des analen Segments der Larven und eine ähnliche Chaetotaxie der Puppen, sondern auch einen ähnlichen Bau des Hypopygs der Männchen. Die geobionte und apomorphe Untergattung *Tipula* ausgenommen, haben beide anderen Untergattungen ihre Blütezeit wohl am Ende des Palaeogen oder im Miozän erreicht; darauf weist die Verschiedenheit ihrer archaischen Formen in der ursprünglichen Fauna von Südostasien hin.

Die Untergattungen *Savtshenkia, Mediotipula* und *Beringotipula* haben taxonomisch eine sehr isolierte und phylogenetisch unsichere Stellung innerhalb der Gattung *Tipula*. Das Vorkommen von rudimentären Analkiemen und ein rudimentärer Haarsaum um das Stigmenfeld bei den *Savtshenkia*-Larven die sich in xeromorpher Richtung entwickelten, deuten auf eine Abstammung dieser Untergattung von plesiomorphen, helo- und hydrobionten Gruppen aus der Gattung *Tipula*. Der charakteristische Fortsatz am Ende der Hypovalven der weiblichen Puppen (in unserer Fauna auch bekannt von den weiblichen *Dolichopeza*-Puppen) bringt die Untergattung *Savtshenkia* sogar näher zu den Dolichopezinae. Es ist interessant, daß dieser Fortsatz auch bei den weiblichen Puppen von *Mediotipula* vorkommt, deren Arten — was den Komplex der anderen Merkmale betrifft — ziemlich stark apomorph sind. Deshalb muß *Mediotipula*, ungeachtet ihrer hohen Spezialisation, wahrscheinlich doch von den archaischen Gruppen der Gattung *Tipula* abgeleitet werden. Dasselbe gilt auch für die Untergattung *Beringotipula*, deren Larven nicht nur apomorphe Merkmale zeigen wie eine starke Sklerotisation der Randlappen um das Stigmenfeld, sondern auch plesiomorphe wie einen Haarsaum um das Stigmenfeld.

Die meistapomorphen Zweige der Gattung *Tipula* sind die geologisch ziemlich jungen Untergattungen *Pterelachisus, Oreomyza, Vestiplex, Lunatipula* und *Odonatisca*, ein Komplex von Untergattungen, der möglicherweise auch als Gattung qualifiziert werden kann (Theowald, 1957). Eine Reihe von Merkmalen deuten auf die Verwandtschaft dieser Untergattungen, die wahrscheinlich irgendwann im Oligozän oder Miozän anfingen sich in xeromorphe Richtung zu entwicklen, und am Ende des Neogens eine beträchtliche Blütezeit erreichten — *Lunatipula* und *Odonatisca* wahrscheinlich noch später —, und zwar Merkmale wie die Flügeladerung und die Flügelzeichnung, der Bau des Hinterrandes des 9. Tergites bei den Männchen, der geobionte Larventyp mit mehr oder weniger sklerotisierter Oberfläche der dorsalen und lateralen Randlappen um das Stigmenfeld, die stark entwickelten aber nicht zahlreichen Dornen auf dem Abdomen der Puppen u.s.w. (Savtshenko, 1964). Diese Untergattungen, die ziemlich apomorph sind, zeigen aber auch manche plesiomorphe Merkmale, zum Beispiel eine primitive Chaetotaxie bei den Larven, die wahrscheinlich von ancestralen Formen, die, wie anzunehmen ist, weniger spezialisierte und mehr archaische Gruppen der Gattung *Tipula* waren, vererbt wurden.

Den ancestralen Formen am nächsten stehen wohl die Untergattungen *Pterelachisus* und *Oreomyza*, von denen die zweite direkt von der ersten abzweigte. Direkte Verwandtschaft zwischen beiden sieht man einerseits bei *T. (Pterelachisus)*

mutila Wahlgren und anderseits bei *T. (Oreomyza) trifasciata* Loew, die viele Merkmale gemeinsam haben, einerseits im Bau des Hypopygs der Männchen, anderseits in der Flügeladerung (Savtshenko, 1964).

An einer Abzweigung der Untergattung *Vestiplex* von einer mit der Untergattung *Pterelachisus* gemeinsamen Wurzel besteht kein Zweifel. Bis in unsere Zeit findet man in der Fauna von Ostasien Übergangsformen zwischen beiden Untergattungen (zum Beispiel *T. ambigua* Savtshenko), die manchmal nur schwierig in einer dieser Untergattungen unterzubringen sind, weil sie nach dem Bau des Ovipositors zu *Vestiplex*, nach dem Bau des Hypopygs aber zu *Pterelachisus* gehören (Savtshenko, 1964).

Die Untergattung *Lunatipula* nimmt eine stärker isolierte Stellung ein. Die ancestralen Formen dieser Untergattung zweigten von der für den ganzen Komplex gemeinsamen Wurzel wahrscheinlich noch vor der Abzweigung der Untergattungen *Pterelachisus* und *Vestiplex* ab. Direkt aus *Lunatipula* differenzierte sich im Neogen ohne Zweifel die Untergattung *Odonatisca*, die am meisten xerophile und jüngste Untergattung dieses Komplexes. Die nahe phylogenetische Verwandtschaft zwischen *Lunatipula* und *Odonatisca* wird bestätigt durch gemeinsame Merkmale im Bau der Larven und Puppen. Die Larven von *Odonatisca* zum Beispiel haben dieselben gänzlich sklerotisierten, hakenförmigen dorsalen und lateralen Randlappen um das Stigmenfeld wie die Larven der *livida*-Gruppe der Untergattung *Lunatipula*, und, was den Bau der Puppen betrifft, zeigen sie nur wenige Unterschiede gegenüber den im Mittelmeergebiet vorkommenden Arten der *falcata*-Gruppe der Untergattung *Lunatipula*. Der Anhang am Hinterrand des 8. Sternits bei den Männchen von *Odonatisca* kann leicht von den homologen, jedoch nicht so stark entwickelten Strukturen am Hinterrand dieses Sternites bei den Arten der *falcata*-Gruppe abgeleitet werden.

Die stark apomorphe Untergattung *Dendrotipula*, die sich irgendwann im Oligozän entwickelte, erreichte ihre Blütezeit im Miozän und entwickelte sich sehr weit in Richtung Anpassung der praeimaginalen Stadien an eine Ernährung von Verwesungsprodukten faulenden Laubholzes. Apomorphe Merkmale wie zum Beispiel die Reduktion der dorsalen und lateralen Randlappen des Stigmenfeldes der Larven und die Verkürzung der mesothorakalen Atmungsröhrchen bei den Puppen finden wir auch bei den Ctenophorinae. Es besteht aber keine direkte phylogenetische Verwandtschaft zwischen beiden, weil die Larven von *Dendrotipula* keinen Haarsaum um das Stigmenfeld haben und mehr apomorph sind als die Larven der Gattung *Ctenophora*, bei denen ein solcher Haarsaum vorhanden ist. Theowald (1957) weist auf eine Verwandtschaft der Untergattung *Dendrotipula* mit den Untergattungen *Pterelachisus* und *Oreomyza* hin, und zwar auf Grund des Baues des analen Segments ihrer Larven und Puppen. Eine Verwandtschaft dieser drei Untergattungen zeigt auch der plesiomorphe Typ der Chaetotaxie ihrer Larven an. Darauf begründet, gewinnt die Hypothese, daß die ancestralen Formen von *Dendrotipula* von einer mit den Untergattungen *Pterelachisus* und *Oreomyza* gemeinsamen Wurzel abzweigten, und zwar noch vor der Abzweigung von *Lunatipula* und *Vestiplex* (Abb. 5), an Wahrscheinlichkeit.

Nephrotoma ist im imaginalen wie im larvalen Stadium nur sehr undeutlich

gegliedert, weshalb auch sichere Aussagen über die Verwandtschaftsbeziehungen innerhalb dieser Gattung schwierig zu machen sind. Man kann nur annehmen, daß unter den ukrainischen Arten dieser Gattung die Arten der *scalaris-crocata*-Gruppe, die sich durch dunkle Leibespigmentierung und manche von ihnen durch eine Tendenz zum Leben auf offenem Feld in ziemlich trockenen Umständen (*N. rossica* Riedel) auszeichnen, am meisten apomorph sind.

Von *Dictenidia* gibt es in der ukrainischen Fauna nur eine ziemlich apomorphe, dunkel gefärbte Art, deren Hypopyg komplizierter gebaut ist als das der anderen, hell gefärbten Arten dieser Gattung aus Südostasien. Unsere Art repräsentiert unter den *Dictenidia*-Arten deshalb vielleicht einen jüngeren und mehr spezialisierten Zweig.

Innerhalb der Gattung *Ctenophora* sind auf Grund des Baues des praeimaginalen Stadien die ukrainischen Arten der *pectinicornis-guttata*-Gruppe, deren Larven deutlich entwickelte Randlappen um das Stigmenfeld haben, mehr plesiomorph und die Arten der *fastuosa-festiva*-Gruppe mit reduzierten Randlappen mehr apomorph. Nach imaginalen Merkmalen sind beide Gruppen verbunden durch die *elegans*-Gruppe als Übergangsform. Es ist nicht klar erkennbar, wie die Evolution vor sich ging: von der ersten zur zweiten Gruppe oder umgekehrt. Letzteres sieht wahrscheinlicher aus, weil die *fastuosa-festiva*-Gruppe für die alte Fauna von Südostasien charakteristisch ist und die *pectinicornis-guttata*-Gruppe für die verhältnismäßig junge boreale Fauna.

Ganz sicher sind die phylogenetischen Verhältnisse innerhalb der Gattung *Tanyptera*. Die ukrainischen Arten dieser Gattung sind der jüngste apomorphe Zweig, dessen Männchen einen sehr stark spezialisierten Bau des Hypopygs haben, das durch die nur kleine Öffnung und eine fast horizontale Lage der Styli im Genital-Raum prinzipiell von demselben Organ der anderen Tipulidae verschieden ist. Dieser Zweig entwickelte sich in den gemäßigten Breiten aus den plesiomorphen ostasiatischen Arten der Gattung, die ein Hypopyg des normalen Tipulidae-Typs haben, das heißt mit breiter Öffnung und mehr oder weniger vertikaler Lage der Styli. Zwischen diesen beiden Gruppen finden wir in unserer heutigen Fauna noch eine Übergangsform, die auf die Richtung der Evolution in dieser Gattung hinweist. Es ist eine kleine und ziemlich seltene Art aus dem Fernen Osten (*T. parva* Portschinsky), die in den Küstengebieten der Sovjet-Union (Primorskij Kraj) und in Japan vorkommt.

Die Hauptblütezeit der Gattungen *Ctenophora* und *Tanyptera* fand wahrscheinlich im Neogen statt, als sich die Laubwälder, an die diese Gattungen ökologisch und trophisch gebunden waren, in den gemäßigten Breiten von Eurasien im Norden und im Westen viel weiter ausdehnten als heute.

SYSTEMATIK UND KLASSIFIKATION

Die moderne Systematik der Tipulidae ist noch recht ungenügend bearbeitet und ist hauptsächlich auf die Imagines und hier wiederum auf morphologische Merkmale begründet. Erst in letzter Zeit sind die ersten Versuche gemacht worden, auch die Larven und die biologischen Merkmale für ein neues System

dieser Familie zu benützen (Theowald, 1957; Savtshenko, 1961).

Seit Latreille (1802), der die Familie Tipulidae für die Gattung *Tipula* von Linnaeus errichtete, haben während des neunzehnten Jahrhunderts die meisten Systematiker diese Familie ganz breit aufgefaßt, und neben den Tipulidae auch die Limoniidae und Cylindrotomidae eingeschlossen, manchmal sogar auch die Trichoceridae und die anderen Tipuloidea (Zetterstedt, 1842; Rondani, 1856; Schiner, 1864; Osten-Sacken, 1878, und andere). Diese breite Auffassung der Familie als Komplex von Tipulidae, Limoniidae und Cylindrotomidae, die dann nur den Rang von Unterfamilien erhalten, akzeptieren auch die heutigen englischen und amerikanischen Systematiker (Edwards, 1938; Alexander, 1942; Coe, 1950; und andere).

Seit Kertesz (1902) sieht die Mehrzahl der europäischen Systematiker die Tipulidae als eine unabhängige Familie neben Limoniidae und Cylindrotomidae an, meistens jedoch ohne besonderere Begründung ihres Standpunktes (Hendel, 1928, 1936/37; Hennig, 1950; Mannheims, 1951; Theowald, 1957a; Savtshenko, 1961). Nur Peus (1952) bemerkt, daß eine derartige Einteilung und Qualifikation mehr den Forderungen eines natürlichen Systems entspricht und überdies Vorteile in Bezug auf Übersichtlichkeit hat.

Die Tipulidae verdienen aber den Rang einer Familie nicht nur auf Grund von Übersichtlichkeit, sondern auch aus mehr prinzipiellen Erwägungen. Wenn man die höheren systematischen Gruppen nicht nur als etwas sieht, das seine Ursache in dem Bedürfnis des Menschen zum systematisieren hat (Peus, 1952), sondern als reelle Kategorien, die konkret die Entwicklungsgeschichte und die heutige Struktur von bestimmten Gruppen von Organismen darstellen, dann wird der Familienrang der Tipulidae keinen Widerspruch entfachen dürfen. Wie schon früher bemerkt, unterscheiden sich die Tipulidae wesentlich von den am besten mit ihnen übereinstimmenden anderen Gruppen der Tipuloidea, insbesondere den Limoniidae und Cylindrotomidae, ganz zu schweigen von den Trichoceridae, durch einen ganzen Komplex von Merkmalen: die Morphologie aller ihrer Entwicklungsstadien, der Bau des männlichen Hypopygs, ihre Anforderungen an die Umwelt, ihre trophischen Bindungen und andere, durch die sie als eine systematische Einheit mit spezifischen, nur für sie kennzeichnenden Evolutions-Tendenzen charakterisiert sind. Es muß hinzugefügt werden, daß die Tipulidae sich als unabhängige Familie aus den schon längst ausgestorbenen Architipulidae entwickelt haben, und daß Limoniidae und Cylindrotomidae sich aus einer Schwestergruppe nicht der heutigen Tipulidae, sondern der Architipulidae gebildet haben. Aus all diesen Gründen bleibt der Autor dieser Arbeit dabei — wie in seinen anderen Arbeiten —, daß die Tipulidae eine unabhängige, morphologisch, biologisch und evolutionell deutlich abgegrenzte Familie sind. Es ist interessant zu bemerken, daß nach Hennig (1950) die Tipulidae als eine sehr früh differenzierte Gruppe unter den anderen Familien der Diptera den Rang einer Superfamilie verdienen.

Während des neunzehnten Jahrhunderts haben mehrere Systematiker die von Linnaeus (1758) aufgestellte Gattung *Tipula,* die nicht nur Tipulidae sondern auch andere Tipuloidea umfaßte, in kleinere natürlichere Gattungen aufgeteilt.

Der Klassiker der Dipterologie Meigen (1800) hat als erster von *Tipula* die Gattungen *Pales* (*Nephrotoma*, 1803) und *Flabellifera* (*Ctenophora*, 1803) abgetrennt, deren erste später von Macquart (1834) als *Pachyrrhina* zum zweiten Mal beschrieben wurde. Durch eine Entscheidung der I.C.Z.N. (1963) sind die Namen *Pales* und *Flabellifera* unterdrückt worden.

Curtis (1825) trennte *Dolichopeza*, eine Gattung, die von Meigen (1830) als *Leptina* und von Macquart (1846) als *Apeilesis* beschrieben wurde, von *Tipula* ab. Loew (1844) beschrieb die Gattung *Prionocera* (*Stygoropis* Loew, 1863). Latreille (1804) stellte einen Teil der Arten aus Meigens Gattung *Ctenophora* in *Tanyptera*, eine Gattung, die 30 Jahre später von Brullé (1832) aufs neue als *Xiphura* beschrieben wurde. Für eine der Arten aus der Gattung *Ctenophora* errichtete Brullé (1833) die Gattung *Dictenidia*, die in Arbeiten späterer Autoren auch als *Ceroctenia* (Rondani, 1856) und *Dicera* (Lioy, 1863) aufgeführt wird.

Von mehreren Autoren (Wiedemann, 1828; Macquart, 1838; Loew, 1869; Osten-Sacken, 1869, 1886; Westwood, 1876; Skuse, 1890) wurden auch Gattungen aus den Gebieten außerhalb der Palaearktis beschrieben. Infolge dieser schnelle Erhöhung der Anzahl von Gattungen entstand das Bedürfnis nach höheren Kategorien.

Als erster hat wahrscheinlich wohl Kertesz (1902) die Tipulidae in seinem Catalogus in drei Unterfamilien aufgeteilt: Dolichopezinae, Ctenophorinae und Tipulinae. Von unserer Fauna rechnet er *Dolichopeza* zur ersten Unterfamilie, *Dictenidia*, *Ctenophora* und *Xiphura* (= *Tanyptera*) zur zweiten und *Tipula* (inkl. *Nigrotipula*) und *Nephrotoma* zur dritten. Diese Einteilung, die auf unterschiedliche Flügeladerung (Dolichopezinae und Tipulinae) und verschiedenen Bau der Antennen bei den Männchen (Tipulinae und Ctenophorinae) begründet ist, wurde von den meisten Systematikern übernommen, insbesondere von Enderlein (1936), Hendel (1936/37) und Mannheims (1951, 1954).

In vielen seiner Arbeiten benützt auch Alexander diese Einteilung. Bei Alexander und anderen Systematikern, die die Tipulidae als Unterfamilie qualifizieren, werden dementsprechend die Unterfamilien von Kertesz als Tribus aufgeführt.

Eine etwas andere Einteilung der Familie Tipulidae wurde von Pierre (1926) aufgestellt. Aus nur formellen Gründen ohne Rücksicht auf phylogenetische Aspekte, teilte er die Familie ein in zwei Hauptgruppen oder Divisionen, die sich nur im Bau der Antennen voneinander unterscheiden. Die erste Division — Tipulinae filicornae — umfaßt die größte Zahl der Gattungen dieser Familie. Sie haben die Antennen nicht kammartig gebaut. Die zweite, kleinere Division — Tipulinae ramicornae — hat, wenigstens bei den Männchen, charakteristische kammförmige Antennen.

Masaki (1933) folgt Pierre und unterscheidet ebenso nur zwei Subfamilien: Plusiomyini — Gattungen mit kammförmigen Antennen — und Tipulini — alle anderen Gattungen. (Bemerkung: Plusiomyini nach der tropischen Gattung *Plusiomyia* Skuse.)

Es ist eindeutig klar, daß diese Einteilungen von Pierre und Masaki im Vergleich mit der Einteilung in drei Subfamilien einen Schritt zurück bedeuten, weil nur auf

den Bau der Antennen, nicht aber auf andere morphologische, biologische oder geografische Merkmale geachtet wird. Diese Einteilung ist daher sehr künstlich. Nach Masaki sind zum Beispiel die palaearktischen Ctenophorinae, von denen nur die Männchen kammförmige Antennen haben, in einer und derselben Gruppe zusammen mit einer Reihe von tropischen Arten, deren Männchen und Weibchen kammförmige Antennen haben, aber nach dem Komplex aller anderen Merkmale viel näher den Tipulinae oder Dolichopezinae stehen.

Auch Lameere's (1906) Einteilung der Tipulidae in zwei Tribus ist mehr oder weniger künstlich. Lameere unterscheidet die Dolichopezinae und die Tipulinae. Charakteristisch für die Dolichopezinae ist das Fehlen von Tibialdornen und auch das Fehlen einer Diskoidalzelle. Die Gattung *Dolichopeza* ausgenommen, haben aber die meisten anderen Dolichopezinae eine Diskoidalzelle wie die Tipulinae.

Auf die Tatsache hinweisend, daß die Einteilung der Familie in drei Unterfamilien auf — auf den ersten Blick — sekundären und taxonomisch wenig wichtigen morphologischen Unterschieden fußt, welche überdies bei den Ctenophorinae sekundäres Geschlechtsmerkmal sind, erklärt sich Alexander (1920, 1942) als Vertreter einer vollständigen Zurückweisung der Unterfamilien und will zurück zur alten Einteilung in nur Gattungen. Seiner Meinung nach ist dies zweckmäßiger, weil — mit weiter Kenntnis der exotischen Tipulidae — die Grenzen zwischen den Subfamilien immer undeutlicher werden. Dasselbe wird auch von Theowald (1957) vorgebracht, der ein neues System für die westpalaearktischen Tipuliden aufstellt, begründet auf dem Studium von imaginalen und praeimaginalen Merkmalen, wobei er in dieser Familie keine Taxa von höherem als Gattungsrang aufführt.

In dieser Arbeit wird aber die allgemein akzeptierte Einteilung der Familie in drei Unterfamilien erhalten und zwar nicht nur, weil sie das System der Tipulidae mehr übersichtlich macht, was aus praktischen Erwägungen sehr wichtig ist, da sie die Bestimmung erleichtert, sondern auch, weil sie vom phylogenetischen Standpunkt (Abb. 4) die realen Verhältnisse innerhalb der Familie erkennen läßt. Sie zeigt unabhängige Gruppen von ungleichem Umfang, ungleicher morphologischer Differenzierung, ungleichem geologischem Alter und ungleichem zoogeographischem Wert. Im Gegensatz zu der Behauptung von Alexander gibt es zwischen diesen drei Unterfamilien der Tipulidae — nach dem ganzen Komplex von imaginalen und praeimaginalen Merkmalen — genügend und deutliche morphologische Unterschiede, welche sich manifestieren in der Färbung und Zeichnung des Körpers, in der Beinlänge, und insbesondere im Bau des Hypopygs der Männchen wie auch im Bau des Hinterleibsendes der Larven. Schließlich, jede dieser Unterfamilien zeigt eine bestimmte Richtung der Evolution innerhalb dieser Familie, nämlich die Dolichopezinae hauptsächlich den Übergang einer hydrobionten zu einer bryobionten Lebensweise auf dem Land, die Tipulinae (mit nur wenigen Ausnahmen) den Übergang einer hydrobionten zur helobionten und geobionten Lebensweise, die Ctenophorinae den Übergang einer hydrobionten zur saproxylobionten Lebensweise. Rohdendorf (1964) bemerkt ganz richtig, daß Taxa von höherem Rang nicht nur vom morphologischen Standpunkt, sondern vielseitig, als eine Einheit oder eine Harmonie, gesehen werden müssen, die sich

durch bestimmte Existenzvoraussetzungen, die sich in gleichem Bau, gleichen Funktionen und gleicher ontogenetischer Entwicklung zeigen, kennzeichnet.

Wenn man bei den Tipulidae — einer der meist archaischen Familien der Diptera — dieselben taxonomischen Kriterien anlegt wie bei den höher entwickelten Gruppen dieser Ordnung, dann kann auch das Fehlen von deutlichen Grenzen zwischen manchen Unterfamilien nicht ein Grund zu ihrer Abschaffung sein. Das Vorkommen von Übergangsformen zwischen einer Unterfamilie und der anderen in solch einer archaischen Gruppe von Diptera wie die Tipulidae — in der bis in unsere Zeit viele Elemente aus dem Palaeogen und sogar aus dem Mesozoikum vorkommen — ist ganz natürlich. In diesem Zusammenhang bemerken wir, daß ähnliche "Brücken" auch zwischen den Tipulidae und andere Familie der Tipuloidea vorkommen, zum Beispiel zwischen Dolichopezinae und Limoniidae, anderseits auch zwischen Gattungen innerhalb der Tipulidae, zum Beispiel *Nephrotoma* und *Tipula,* zwischen den orientalischen Arten von *Dolichopeza* und *Oropeza* und auch zwischen den orientalischen *Pselliophora's* und den palaearktischen *Ctenophora's.*

Meist werden im System der Tipulidae als erste Subfamilie die Dolichopezinae, als zweite die Ctenophorinae und als dritte die Tipulinae aufgeführt, was dem Standpunkt von Edwards (1926) entspricht, nach dem die xylobionten Arten primitiver sind als die hydro- und helobionten. Dies steht aber im Widerspruch zu den eigentlichen phylogenetischen Verhältnissen in der Familie der Tipulidae, wie oben schon erwähnt wurde. Die Tipulinae sind mit den am meisten plesiomorphen Dolichopezinae deutlich näher verwandt als mit den Ctenophorinae, die als saproxylophage Arten zu der am meisten apomorphen und spezialisiertesten Gruppe dieser Familie gehören. Deshalb müssen die Tipulinae im System der Familie an zweiter und nicht an dritter Stelle stehen, was mit den interfamiliären phylogenetischen Verhältnissen (Abb. 4) übereinstimmt.

Die Behandlung der Systematik innerhalb der Unterfamilie der Dolichopezinae gehört nicht in diese Arbeit, da in der ukrainischen Fauna diese Unterfamilie nur durch eine Gattung vertreten ist. Was die Unterfamilie Tipulinae anlangt, so hat man bis heute nicht versucht, sie in Supergattungen oder Tribus einzuteilen. Es besteht aber kein Zweifel, daß die ukrainischen Tipulinae sich morphologisch und phylogenetisch leicht in zwei unabhängige Gruppen einteilen lassen, die zwei verschiedene Evolutionsrichtungen darstellen. Die erste Gruppe sind die Arten mit gesägten Antennen aus der Gattung *Prionocera,* die mit der Unterfamilie der Dolichopezinae nahe verwandt sind. Die zweite Gruppe sind alle anderen Tipulinae, die von denselben ancestralen Formen entstanden sind wie *Prionocera,* sich aber parallel zu ihnen entwickelten. Nach dem phylogenetischen Schema (Abb. 4) ist es zweckmäßig, beide Gruppen als unabhängige Stämme zu sehen: die Prionocerini und die Tipulini. Der erste von ihnen ist in unserer Fauna vertreten durch die Gattung *Prionocera,* der zweite durch *Nigrotipula, Tipula* und *Nephrotoma.*

Auch die Unterfamilie Ctenophorinae kann in zwei Tribus eingeteilt werden: Ctenophorini und Tanypterini, die deutlich in morphologischer und biologischer Hinsicht verschieden sind. Die Ctenophorini sind als Imagines durch einen ziem-

lich einfachen Bau des Hypopygs und eine fast vertikale Stellung der Styli, durch einen kurzen Ovipositor, der immer kürzer ist als die Hälfte des Abdomens, und durch kurze Hypovalven, die bei weitem nicht das Ende der Cerci erreichen, gekennzeichnet. Die Larven der Ctenophorini haben mehr oder weniger entwickelte Randlappen um das Stigmenfeld und manchmal einen rudimentären Haarsaum am Rande des Stigmenfeldes. Die Puppen haben am Mesothorax ziemlich lange Atmungshörnchen, die von normaler Form sind. Die Entwicklung der Larven dieser Familie findet in Holz, das zu amorphem Mulm verfault ist, statt. Für die Tribus Tanypterini ist nachfolgendes charakteristisch: das Hypopyg der Männchen ist stark modifiziert, und die Stellung der Styli ist fast horizontal; die Weibchen haben einen sehr langen Ovipositor (fast solang wie die Hälfte des Abdomens, die langen Hypovalven erreichen fast das Ende der Cerci). Die Randlappen um das Stigmenfeld der Larven sind fast vollständig reduziert; die Puppe hat nur kurze, längliche, am Rande gerillte mesothorakale Atmungshörnchen. Die Arten entwickeln sich in Holz, das noch nicht ganz zu Mulm verfault ist. In der ukrainischen Fauna gehören die Gattungen *Dictenidia* und *Ctenophora* zu den Ctenophorini und *Tanyptera* zu den Tanypterini.

Alexander (1936, 1954) und nach ihm Theowald (1957) sind der Meinung, daß alle Gattungen der Ctenophorinae, die orientalischen Gattungen *Plocimas* und *Prionota* ausgenommen, nur den Rang von Untergattungen haben sollen, weil zwischen ihnen keine wirklichen Unterschiede sind, abgesehen vom Bau der Antennen bei den Männchen, der zu den sekundären Geschlechtsmerkmalen gehört. Die Gattungen *Dictenidia, Ctenophora* und *Tanyptera* werden deshalb von ihnen als Untergattungen aufgeführt. Was die Gattung *Tanyptera* betrifft, soll diese auf Grund von oben aufgeführten Unterschieden nicht nur Gattungsrang beibehalten sondern sogar als Tribus aufgeführt werden müssen. Solche wirklichen Unterschiede gibt es auch zwischen den Gattungen *Dictenidia* und *Ctenophora*. Erstens sind nicht nur die Antennen der Männchen, sondern auch die Antennen der Weibchen auf andere Weise gebaut, weshalb es sich nicht nur um ein sekundäres Geschlechtsmerkmal handeln kann. Überdies:

	Dictenidia	*Ctenophora*
Brustseiten	immer nackt	immer behaart
Flügel der ♂♂	oft mit Mikrotrichien	fast immer nackt
9. Sternit und id	einfach gebaut	mehr oder weniger kompliziert
Ovipositor der ♀♀	gerade	etwas gebogen
Stigmenfeld der Larve	ohne Haarsaum	mit Haarsaum
Mesothorakale Atmungshörnchen der Puppen	an der Vorderseite des Körpers	beiderseits des Körpers
Verbreitung	nur palaearktisch	holarktisch-orientalisch

Deshalb müssen *Dictenidia* und *Ctenophora* nicht nur als Untergattungen, sondern als morphologisch und geographisch ziemlich stark voneinander abgegrenzte Gattungen angesehen werden, was übereinstimmt mit den Prinzipien

der Einteilung der Tipulidae in infrafamiliäre Taxa, welche Prinzipien in dieser Arbeit beibehalten werden.

Besondere Aufmerksamkeit erfordert die Problematik der polymorphen Gattung *Tipula*, zu der etwa 57% der Arten der Weltfauna und 71% der ukrainischen Arten dieser Familie gehören. Schon Schummel (1833) — die Flügelzeichnung als Basis nehmend — teilte die Gattung *Tipula* in eine Reihe von Artengruppen auf. Von den späteren Bearbeitern hat Riedel (1913) diese Einteilung trotz ihrer Künstlichkeit übernommen. Erst Edwards (1931) hat — nachdem er die Gattung *Tipula* in Untergattungen gruppiert hatte — die taxonomischen Grenzen an Hand von Komplexen imaginaler Merkmale wissenschaftlich motiviert. Einige richtig motivierte Untergattungen wurden auch von Bezzi (1924) und Alexander (1924) aufgestellt. Bis in letzte Zeit aber war die Systematik der Gattung *Tipula* sehr dürftig, weil manche ihrer Untergattungen, wie auch zum Großteil die Gruppen von Schummel und Riedel, morphologisch, ökologisch und phylogenetisch sehr ungleiche und ungleichwertige Elemente vereinigten. Besonders die Untergattung *Oreomyza* s.l. war sehr heterogen und enthielt nach Alexander (1935, 1942) und Wu (1940) eigentlich eine zufällige Zusammenstellung von oft phylogenetisch weit voneinander entfernten Arten, deren systematische Stellung in der Gattung aus irgendeinem Grund unsicher war.

Auf Grund von vergleichend morphologischen Untersuchungen der imaginalen und larvalen Stadien und auch in Anbetracht von Besonderheiten der Ökologie und der Fortpflanzung (Hemmingsen, 1954—1962) hat der Autor einige neue Untergattungen unterschieden, in denen die *luteipennis—autumnalis*-Gruppe, *rufina—obsoleta—signata*-Gruppe, *unca*-Gruppe, *variipennis—irrorata*-Gruppe, *juncea*-Gruppe und *flavolineata*-Gruppe untergebracht sind, und den Umfang einiger anderer Untergattungen näher präzisiert; diese letzten Untergattungen waren schon von Edwards für die *oleracea—paludosa*-Gruppe, die *variicornis*-Gruppe und die *lateralis—pruinosa*-Gruppe aufgestellt worden (Savtshenko, 1961, 1964). Neue Untergattungen für die *bidens—stigmatella*-Gruppe und die *bistilata*-Gruppe wurden in der letzten Zeit motiviert von Mannheims (Mannheims & Pechlaner, 1963) aufgestellt, der auch die Richtigkeit der Namen mancher schon früher beschriebener Untergattungen überprüfte. Alexander (1965) stellte eine Untergattung auf für einige asiatische Arten, zu denen auch die europäische *saginata* Bergroth paßt.

Der neuen Klassifikation entsprechend ist die Gattung *Tipula* in der ukrainischen Fauna vertreten durch 16 Untergattungen: *Platytipula* Matsumura, *Schummelia* Edwards, *Savtshenkia* Mannheims, *Yamatotipula* Matsumura, *Acutipula* Alexander, *Tipula* s.str., *Mediotipula* Pierre, *Beringotipula* Savtshenko, *Pterelachisus* Rondani, *Oreomyza* Pokorny, *Lindnerina* Mannheims, *Vestiplex* Bezzi, *Lunatipula* Edwards, *Emodotipula* Alexander, *Odonatisca* Savtshenko und *Dendrotipula* Savtshenko.

Was die umfangreiche Gattung *Nephrotoma* betrifft, gibt es noch keine motivierten Gründe zum Aufstellen von Untergattungen, weil jene Unterschiede zwischen den Artengruppen, die bei den Imagines gefunden wurden, in den praeimaginalen Stadien nicht bestehen oder noch nicht gefunden wurden.

LITERATURLISTE

Alexander, C., 1920. The crane-flies of New York. Part II. Biology and phylogeny. — Cornell-Univ. Agric. Exper. Sta., Mem. 25: 765—993.

———, 1924. Zoological results of the Swedish expedition to Central Africa 1921. Insecta, 6. Tipulidae (Diptera). — Arkiv Zool. 16(18): 1—15.

———, 1926. New or little known Tipulidae from eastern Asia (Diptera), part. 1. — Philipp. J. Sci. 31: 363—383.

———, 1931. Crane-flies of the Baltic Amber (Diptera). — Bernstein-Forschungen 2: 1—135.

———, 1935. New or little-known Tipulidae from Eastern Asia (Diptera), XXIII-XXIV. — Philipp. J. Sci. 56: 525—562.

———, 1936. New or little-known Tipulidae from Eastern Asia (Diptera), XXXI. — Philipp. J. Sci. 60: 165—204.

———, 1942. The Diptera or true flies of Connecticut. Tanyderidae, Ptychopteridae, Trichoceridae, Anisopodidae, Tipulidae. — Connectic. Sta. Geol. Nat. Hist. Surv., Bull. 64: 183—486.

———, 1954. Records and descriptions of Japanese Tipulidae (Diptera). Pt. IV. The crane-flies of Shikoku. — Philipp. J. Sci. 83: 263—306.

Bezzi, M., 1924. Una nuova *Tipula* della alpi con ali ridotte anche nell maschina (Dipt.). — Ann. Mus. Civ. Stor. Nat. Giacomo Doria 51: 228—233.

Bode, A., 1953. Die Insektenfauna des Ostniedersachsischen Oberen Lias. — Palaeontographica (A) 103: 296—318.

Bodenheimer, F., 1924. Beiträge zur Kenntnis der Kohlschnake (*Tipula oleracea* L.). — Arch. Naturg. (A) 90(2): 61—108.

Brauns, A., 1953. Sind Schnakenlarven immer nur schädlich? — Gesunde Pflanzen (V) 2.

Brullé, A., 1832. Mémoire sur un genre nouveau de Diptères de la famille des Tipulaires. — Ann. Soc. Entom. France 1: 205—209.

———, 1833. Notes sur le genre *Xyphura*, formé aux dépens de celui de *Ctenophora* Meigen. — Ann. Soc. Entom. France 2: 398—402.

Byers, G., 1961. The crane-fly genus *Dolichopeza* in North America. — Univ. Kansas sci. Bull. 42(6): 665—924.

Coe, R., P. Freeman & P. Mattingly, 1950. Diptera 2. Nematocera: families Tipulidae to Chironomidae. In: Handbooks for the identification of British insects 9(2): 1—21. — London R. Entom. Soc.

Curtis, J., 1825. British entomology 2: 51—98. — London.

Edwards, F., 1926. The Phylogeny of Nematocerous Diptera: a critical review of some recent suggestions. — Verh. III. Intern. Entom. Kongress. Zürich, 19—25. Juli 1925, Bd. 2: 111—130.

———, 1928. Some Nematocerous Diptera from Yunnan and Tibet. — Ann. Mag. Nat. Hist. (10) 1: 681—703.

———, 1931. Some suggestions on the classification of the genus *Tipula* (Diptera, Tipulidae). — Ann. Mag. Nat. Hist. (10) 8: 73—82.

———, 1938. British short-palped crane-flies. Taxonomy of Adults. — Trans. Soc. Brit. Entom. 5: 1—234.

Ekman, S., 1935. Indo-Westpazifik und Atlanto-Ostpazifik, eine tiergeographische Studie. — Zoogeographica 2: 320—374.

Enderlein, G., 1936. Zweiflügler, Diptera. In: P. Bromer, P. Ehrmann & G. Ulmer, Die Tierwelt Mitteleuropas 6(2), Insekten 3:1—259. — Leipzig.

Essig, E., 1942. College Entomology: 1—900. — New York.

Giljarow, N. S., 1949. Einzelheiten der Bodenbeschaffenheit als Umwelt und ihre Bedeutung für die Evolution der Insekten: 1—277. — Akad. Nauk SSSR, Moskau-Leningrad (russisch).

———, 1951. Bodenbenützung von Insekten in den trockenen Teilen ihrer Areale. — Usp. sovrem. Biol. 32(3—6): 346—351 (russisch).

Handlirsch, A., 1908. Die fossilen Insekten und die Phylogenie der rezenten Formen. — Handbuch Palaeontologen: 1—1433. — Leipzig.

———, 1913. Über einige Beziehungen zwischen Palaeontologie, geographischer Verbreitung und Phylogenie der Insekten. — Trans. 2nd Intern. Congr. Entom. 2: 248—261.

———, 1925. Palaeontologie. In: C. Schröder, Handbuch der Entomologie 3: 117—306.

———, 1939. Neue Untersuchungen über die fossilen Insekten mit Ergänzungen und Nachtragen sowie Ausblicken auf phylogenetische, palaeographische und allgemeine biologische Probleme. II. — Ann. naturhist. Mus. Wien. 49: 1—240.

Hemmingsen, A., 1954. The function of the peculiar process of the 8th sternite in the males of *Tipula* (*Oreomyza*) *staegeri* Peder Nielsen and *Tipula* (*Oreomyza*) *signata* Staeger. — Vidensk. Medd. Dansk naturh. Foren. 116: 411—417.

———, 1956. Deep-boring ovipository instincts of some crane-fly species (Tipulidae) of the subgenera *Vestiplex* Bezzi and *Oreomyza* Pok. and some associated phenomena. — Vidensk. Medd. Dansk naturh. Foren. 118: 243—315.

———, 1958. Adaptations in *Tipula* (*Lunatipula*) *lesnei* Pierre to the dry climate of Gran Canaria. — Vidensk. Medd. Dansk naturh. Foren. 120: 207—236.

———, 1959. A crane-fly (*Tipula juncea* Meigen) living in blown sand. — Entom. Medd. 29: 46—64.

———, 1960. The function of some remarkable cranefly ovipositors. — Entom. Medd. 29: 221—247.

———, 1962. Copulatory adaptations of male hypopygium to female tergal ovipository valves (cerci) in certain crane-flies (Tipulidae). — Vidensk. Medd. Dansk naturh. Foren. 124: 135—163.

Hendel, F., 1928. Zweiflügler oder Diptera. II. Allgemeiner Teil. In: Tierwelt Deutschlands 2: 1—135. — Jena.

———, 1936/37. Diptera. In: Kükenthal & Krumbach, Handbuch der Zoologie 4(2), Insekta 2: 1729—1998.

Hennig, W., 1950. Die Larvenformen der Dipteren 2: 1—458. — Akademie-Verl. Berlin.

———, 1954. Flügelgeäder und System der Dipteren unter Berücksichtigung der aus dem Mesozoikum beschriebenen Fossilien. — Beitr. Entom. 4(3—4): 245—387.

I.C.Z.N., 1963. Opinion 678: The suppression under the plenar powers of the pamphlet published by Meigen, 1800. — Bull. zool. Nomencl. 20: 339—342.

Kertesz, C., 1902. Catalogus Dipterorum hucusque descriptorum. II. Cecidomyiidae, Limnobiidae, Tipulidae, Cylindrotomidae: 1—357. — Lipsiae.

Lameere, A., 1906. Notes pour la classification des diptères. — Mém. Soc. Entom. Belg. 12: 105—140.

———, 1936. Précis de Zoologie 5: 1—536. — Liège.

Latreille, P., 1802. Histoire naturelle générale et particulière des Crustacés et des Insectes 1: 1—394; 2: 1—380; 3: 1—467; 4: 1—387. — Paris.

———, 1804. Nouveau dictionnaire d'histoire naturelle de Déterville 24: 1—238. — Paris.

Lindner, E., 1958. Zur Kenntnis der Eier der Limoniidae (Diptera, Tipuliformia). — Mitt. zool. Mus. Berlin 34(1): 113—132.

———, 1958a. Pilzbewohnende Limoniidenlarven unter besonderer Berücksichtigung von *Limonia quadrinotata* Meigen (Diptera). — Tijdschr. Entom. 101(3—4): 263—281.

Linnaeus, K., 1758. Systema Naturae (Ed. X) 1: 1—824. — Stockholmiae.

Lioy, P., 1863. I Ditteri distributi secondo un nuovo methodo di classificazione naturale. — Atti Ist. Sc. Veneto (3) 9: 187—236.

Loew, H., 1844. Beschreibung einiger neuen Gattungen der europäischen Dipternfauna — Stettin. entom. Ztg. 5: 154—173.

———, 1863. Diptera Americae septentrionalis indigena. — Berl. entom. Zs. 7: 275—298.

———, 1869. Diptera Americae septentrionalis indigena. Centuria octava. — Berl. entom. Zs. 13: 1—52.

Macquart, J., 1834. Histoire naturelle des Insectes Diptères. Suites à Buffon 1: 1—578. — Paris.

———, 1838. Diptères exotiques nouveaux ou peu connus 1 (1): 1—221; 1 (2): 1—207. — Paris.

———, 1846. Diptères exotiques nouveaux ou peu connus. Supp. 1: 133—264. — Paris.

Mannheims, B., 1951. Tipulidae. In: E. Lindner, Fliegen palaearktisch. Region Lief. 167: 1—64.

———, 1954. Die Tipuliden Ostfennoskandiens (Dipt.). — Notulae Entom. 34: 29—50.

Mannheims, B. & E. Pechlaner, 1963. Die Tipuliden Nortirols (Dipt.). — Stuttg. Beitr. Naturk. 102: 1—29.

Masaki, J., 1933. On the Tipulinae of the Japanese Empire. — Mushi 6: 74—95.

Martynova, O. M., 1959. Phylogenetische Beziehungen des mecopteroiden Komplexes. — Trudi Inst. Morf. Zhivot. 27: 221—230. Akad. Nauk SSSR (russisch).

Meigen, J. W., 1800. Nouvelle classification des mouches à deux ailes (Diptera L.) d'après un plan tout nouveau: 1—40. — Paris (In Faksimile: 1945, Bull. zool. Nomencl. 1: 119—160).

Nielsen, P., O. Ringdahl & S. Tuxen, 1954. Diptera I (exclusive of Ceratopogonidae and Chironomidae). — The zoology of Iceland 3(48a): 1—189.

Osten-Sacken, C., 1869. Monographs of the Diptera of North America 4. — Smithson. misc. coll. 219: 1—345.

———, 1878. Catalogus of the described Diptera of North America. 2nd ed. — Smithson. misc. coll. 270: 1—276.

———, 1886. Studies on Tipulidae 1. Review of the published genera of the Tipulidae-longipalpi. — Berl. entom. Zs. 30: 153—188.

Peus, F., 1952. Cylindrotomidae. In: E. Lindner, Fliegen palaearktischen Region, Lief. 169: 1—80.

Pierre, C., 1926. Fam. Tipulidae, subf. Tipulinae. In: Wytsman, Genera Insectorum 186: 1—68.

Riedel, M., 1913. Die paläarktischen Arten der Dipteren-Gattung *Tipula* L. (Diptera). — Abh. Lehrer-Ver. Naturkunde Crefeld: 1—120.

Rogers, J., 1949. The life history of *Megistocera longipennis* (Macquart) (Tipulidae, Diptera), a member of the Neuston fauna. — Occ. Pap. Mus. Zool. Univ. Michigan 521: 1—14.

Rohdendorf, B., 1947. Die Dipteren-Fauna des Jura von Kara-Tau und ihre Bedeutung für die Evolution der Ordnung. — Dokl. Akad. Nauk SSSR 55(8): 757—760 (russisch).

———, 1960. Neue Angaben über das System der Dipteren. — Verh. XI. Intern. Kongr. Entom. 1: 153—158.

———, 1961. Alte Unterordnungen der Dipteren aus dem Trias von Zentralasien. — Paleont. Zh. 3: 90—100 (russisch).

———, 1962. Ordnung Diptera. In: Grundsätze der Palaeontologie 9, Arthropoden: 307—344 (russisch). — Akad. Nauk SSSR, Moskau.

———, 1964. Historische Entwicklung der Diptera: 1—311. — "Nauka", Moskau (russisch).

Rohnert, U., 1950. Wassergefühlte Baumhöhlen und ihre Besiedlung. Ein Beitrag zur Fauna dendrotelmatica. — Arch. Hydrobiol. 44: 472—516.

Rondani, C., 1856. Dipterologiae Italicae prodromus. Genera Italica ordinis Dipterorum etc. 1: 1—264. — Parmae.

Savtshenko, E. N., 1961. Tipulidae, Subfamilie Tipulinae, Gattung *Tipula* L. (1). In: Fauna SSSR, Diptera 2: 1—486 (russisch). — Akad. Nauk SSSR, Moskau-Leningrad.

———, 1963. Über Verbreitung und Biologie der palaearktischen Tipulide, *Tipula* (*Savtshenkia*) *benesignata* Mnnhs. — Dokl. Akad. Nauk URSR 9: 1258—1261 (ukrainisch).

———, 1964. Tipulidae, Subfamilie Tipulinae, Gattung *Tipula* L. (2). In: Fauna SSSR, Diptera 2: 1—502 (russisch). — Akad. Nauk SSSR, Moskau-Leningrad.

———, 1964a. Ökologie der praeimaginale Stadien von *Tipula* (*Savtshenkia*) *odontostyla* Sav. (Diptera, Tipulidae). — Dokl. Akad. Nauk URSR 1: 124—127 (ukrainisch).

Schiner, J., 1864. Fauna Austriaca. Die Fliegen (Diptera) 2: 1—658.

Schummel, T., 1833. Versuch einer genauen Beschreibung der in Schlesien einheimischen Arten der Gattung *Tipula* Meigen, Bachmücke (Beiträge zur Entomologie 3): 1—128. — Breslau.

Sinitzyn, W., 1962. Die Palaeogeographie von Asien: 1—267. — Akad. Nauk SSSR, Moskau-Leningrad.

Skuse, F., 1890. Diptera of Australia 8. The Tipulidae longipalpi. — Proc. Linn. Soc. N.S. Wales (2) 5: 53—139.

Slipka, J., 1950. Stavba facetovych oci u imag rodu *Tipula* L. — Casopis Cesk. Spolec. entom. 47: 96—109.

———, 1950b. Redukavane ocelly u imag celedi Tipulidae. — Biol. listy, Suppl. 2: 67—74.

———, 1952. Vzdusnicova soustava larev Dipter. — Nematocer s hlediska vyvojoveho. — Casopis Cesk. Spolec. entom. 49: 6—15.

———, 1959. *Symplectomorpha stictica* Meig. (Diptera-Nematocera) als fakultativer Halobiont. — Izv. zool. Inst. Sofia 8: 105—108.

Statz, G., 1943/44. Neue Dipteren (Nematocera) aus dem Oberoligocän von Rott. — Palaeontographica (A.A.) 95: 101—107.

Stitz, H., 1926. Mecoptera. In: Biologie der Tiere Deutschlands 21: 1—35. — Berlin.

Swezy, O., 1915. A leaf-mining crane-fly in Hawaii. — Proc. Hawai Entom. Soc. 3: 93—97.

Theobald, N., 1937. Les insects fossiles des terrains oligocènes de France: 1—473. — Nancy.

Theowald, B., 1957. Die Entwicklungsstadien der Tipuliden (Diptera, Nematocera), insbesondere der westpalaearktischen Arten. — Tijdschr. Entom. 100: 195—308.

———, 1957a. De Nederlandse Langpootmuggen (Tipulidae). — Wetenschap. Med. Kon. Ned. Natuurhist. Ver. 24: 1—28.

Tillyard, R., 1918. The Panorpoid complex 1. — Proc. Linn. Socc. N.S. Wales 43: 265—319.

———, 1929. Permian Diptera from Warner's Bay N.S.W. — Nature 123: 778—779.

———, 1937. The ancestors of the Diptera. — Nature 139: 66—67.

Tjeder, B., 1948. The Swedish *Prionocera*. — Opusc. Entom. 13: 75.

Tokunaga, M., 1940. Revision of marine crane-flies (Tipulidae) with descriptions of some species. — Kontyu 14: 133—148.

Westwood, J., 1876. Notae Dipterologicae. — Trans. Entom. soc. London 2: 501—506.

White, M., 1949. Cytological evidence on the phylogeny and classification of the Diptera. — Evolution 3: 252—261.

Wiedemann, C., 1828. Außereuropäische zweiflügelige Insekten. Als Fortsetzung des Meigenschen Werkes 1: 1—608. — Hamburg.

Wu, C., 1940. Catalogus Insectorum Sinensium 5(1) (1939): 1—524.— Peiping.

Wulf, E., 1944. Historische Geographie der Pflanzen. Geschichte der Flora der Erde: 1—545. — Akad. Nauk SSSR, Moskau-Leningrad.

Zacwillichowski, J., 1933. Über die Innervierung und die Sinnesorgane der Flügel von Schnabelfliegen (Panorpa). — Bull. Acad. Polon. Sci. Cl. 1 (B) 2(1—5): 109—124.

———, 1934. Über die Innervierung und die Sinnesorgane des Flügels der Schnake *Tipula paludosa* Meig. — Bull. Acad. Polon. Sci. Cl. 1(B) 2(8—10): 375—383.

Zetterstedt, J., 1842. Diptera Scandinaviae. Disposita et descripta 1: 1—410. — Lundae.

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THE NEW WORLD GENUS *PLUTO* (HYMENOPTERA, SPHECIDAE, PSENINI)

by

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With 71 text-figures

ABSTRACT

A review of the genus *Pluto* Pate with key to the species is presented. Redescriptions of the forms previously published, first descriptions of some opposite sexes and new distribution data are given. The following new taxa are described: *abbreviatus, alphitopus, araguensis, arenivagus cubanus, basifuscus, biformis, castaneipes, colonensis, denticollis, depressus, duckei, emarginatus, evansi, facialis, fritzi, incarinatus, jugularis, marthae, medius zuliensis, menkei, metanus, nitens, obscurus, occipitalis, punctatellus, pygmaeus axillaris, rotundus, rufanalis, rugulosus, scytinus, simplicicollis, spangleri, spinicollis, stenopygidialis, stramineipes, strigellus, trilobatus, zonatus.*

The first review of the genus *Pluto* Pate (*Psenia* Malloch) was given by Malloch (1933) in his study on the Psenini of North America. In 1901, Viereck included the two North American species known to him, *Mimesa tibialis* Cresson and *Psen suffusus* Fox in his new genus *Neofoxia* (type species *Psen atratus* Panzer) together with two species now placed in the genus *Psenulus*, i.e. *Psen frontalis* Fox and *Psen trisulcus* Fox. Malloch (1933) recognized two separate genera, *Diodontus* Curtis, 1834 (*Neofoxia* Viereck, now *Psenulus* Kohl, 1896) and a new genus *Psenia*, the latter to receive those forms in which "the cubitus of the hind wing is distad of the median transverse vein" (cu-a) as in *Diodontus* Curtis (*Psenulus* Kohl) but the "occipital carina is not connected with the carina surrounding the mouth cavity" (hypostomal carina).

Malloch in his diagnosis of *Psenia* rightly mentions the long, downward directed bristly hair on the mid and hind coxa, but some of the other generic characters enumerated by him apply to North American species only. He described or recorded sixteen taxa, including *atricornis* from the West Indies, but not *argentifrons* (Cresson) from Cuba. Pate (1937) changed the generic name into *Pluto, Psenia* being preoccupied by *Psenia* Stephens, 1829 (a synonym of *Psen* Latreille, 1796; type species *Sphex atra* Fabricius, 1793). In 1946, Pate furnished a good redescription of *Pluto argentifrons* (Cresson) and pointed out that the females from Cuba, which Malloch associated with the males of *atricornis* Malloch from Puerto Rico, in fact belong to *argentifrons*. A few years later Krombein (1949) described *arenivagus* as a new species from North America.

Thus far Mexico and South America had yielded very few species. Cameron (1891) published *Psen annulipes* (female) from Mexico, *Psen medius* was described

by Smith (1856) and *Psen Smithii* by Fox (1898), both after males collected in Brazil, and *Psenulus (Neofoxia) Townsendi* by Cockerell (1911) from Peru. Bohart & Menke (1976) assigned these four species to the genus *Pluto*. To Brèthes (1913) we owe the descriptions of two species from Argentina, namely *Psen Jörgenseni* (male) and the female of *Gorytes pygmaeus*. We should be grateful to Mr. M. A. Fritz, Buenos Aires, who recognized this latter specimen as a Psenine wasp. He and Dr. M. J. Viana of the Museum at Buenos Aires kindly enabled me to study the types of both species.

Up till now little attention was paid to South American *Pluto*. It is therefore with great pleasure that I express my gratitude to the many entomologists who allowed me to study their Psenini. Over 1900 specimens of *Pluto* could be examined including many from the Neotropical Region. This study resulted in the description of 22 new species and two new subspecies from South America, 13 new species from Central America, Mexico and the southern states of the United States and one new subspecies from Cuba.

Most of the known species are redescribed and first descriptions of some opposite sexes are also given. The genus *Pluto* now includes 59 species and three subspecies.

The institutions and entomologists who entrusted me their material are mentioned below, preceded by the abbreviations used for their collections:

AMNH — American Museum of Natural History, New York, N.Y., U.S.A.; J. G. Rozen, Jr. and Mrs. M. Favreau
BISH — Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A.; Miss A. Manning, F. J. Radovsky
BM — British Museum (Natural History), Department of Entomology, London, U.K.; L. A. Mound, C. R. Vardy
BSM — Zoologische Sammlung des Bayerischen Staates, Munich, Germany; E. Diller
CAS — California Academy of Sciences, San Francisco, California, U.S.A.; P. H. Arnaud, Jr., Mrs. Helen Court
CIS — California Insect Survey Collection, University of California, Berkeley, California, U.S.A.; J. A. Powell
CNC — Canada National Collection, Entomology Research Institute, Ottawa, Canada; J. Barron, L. Masner, C. M. Yoshimoto
CSC — California State Collection of Arthropods, Sacramento, California, U.S.A.; M. S. Wasbauer
CU — Cornell University, Department of Entomology and Limnology, Ithaca, N.Y., U.S.A.; L. A. Pechuman, A. C. Miller
FAG — Faculté des Sciences Agronomiques, Gembloux, Belgium; J. Leclercq
FSC — Florida State Collection of Arthropods, Gainesville, Florida, U.S.A.; E. E. Grissell
HT — H. and M. Townes collection, American Entomological Institute, Ann Arbor, Michigan, U.S.A.
IML — Instituto Miguel Lillo, Tucumán, Argentina; J. A. Haedo, A. Willink

KU — Snow Entomological Museum, University of Kansas, Lawrence, Kansas, U.S.A.; C. D. Michener, G. W. Byers
KVK — Collection K. V. Krombein, now donated to the Smithsonian Institution, Washington, D.C.
MACN — Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina; M. J. Viana, M. A. Fritz
MCZ — Museum of Comparative Zoology, Harvard College, Cambridge, Massachusetts, U.S.A.; Ms. J. C. White, Ms. M. K. Thayer
MF — M. A. Fritz collection, Buenos Aires, Argentina
ML — Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands; J. van der Vecht, C. van Achterberg, C. van Heijningen
NMW — Naturhistorisches Museum Wien, Vienna, Austria; M. Fischer
NCSU — North Carolina State University, Raleigh, N.C., U.S.A.; D. L. Stephan
OSU — Oregon State University, Entomological Museum, Corvallis, Oregon, U.S.A.; G. R. Ferguson (including G. R. Ferguson collection)
RS — Naturhistoriska Riksmuseet, Stockholm, Sweden; S. Erlandsson
UCD — University of California, Department of Entomology, Davis, California, U.S.A.; R. M. Bohart
UFP — Universidade Federal do Paraná, Departamento de Zoologia, Curitiba, Paraná, Brazil; J. S. Moure
USNM — National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A.; K. V. Krombein, A. S. Menke
UZM — Universidad del Zulia, Maracaibo, Venezuela; via A. S. Menke
ZMB — Zoologisches Museum der Humboldt Universität, Berlin, Germany; E. Königsmann
ZMC — Universitetets Zoologiske Museum, Copenhagen, Denmark; O. Lomholdt

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Pluto Pate, 1937

Psenia Malloch, 1933, type species *Mimesa tibialis* Cresson, 1872, original designation, nec *Psenia* Stephens, 1829.
Pluto Pate, 1937, new name for *Psenia* Malloch; Krombein, 1951; Gittins, 1969.

A good generic diagnosis has been given by Bohart and Menke (1976). Bohart also refers to the distinctive downward directed long bristle on the lower hind margin of the hind coxae; this bristle is most conspicuous in the female and Bohart calls it the most diagnostic and unique feature of *Pluto*. The bristle on the mid coxa is shorter. The clypeal margin is indeed generally relatively simple but the female of the Mexican *clavicornis* (Malloch) has a peculiar snoutlike protruding clypeus and the females of at least a few South American species (*P. joergenseni* (Brèthes),

P. facialis sp. nov.) have either strongly protruding lateral clypeal teeth or an unusually deeply emarginate clypeal apex. The hypo-epimeral area, as well as the mesopleura and the scutum may be coarsely rugose or smooth and shining.

The tyloidea, usually present on most of the antennal segments of the male, may offer good differential characters. They are mostly long and linear, sometimes more or less oval, rarely partly absent on some of the median segments or indistinct on the whole flagellum. In *P. clavicornis* the antennae are clavate like the antennae of a female and there are no distinct tyloidea.

Although the genitalia of the male have been insufficiently studied, the drawings in this paper of the genitalia of a few species show that they are very uniform and I do not expect that they will be of much use to facilitate identification.

The pygidial area of the female shows very little differentiation; its structure leads to the conclusion that all *Pluto* species nest in the soil. Very little is known with certainty about their biology. Most of the notes on the labels relate to the flowers visited. Evans (1959) described the larva of *P. albifacies* (Malloch) and in 1968 the nests as well as the prey, which consisted of nymphs (⅓) and adults of the small green leafhopper *Opsius stactogalus* Fieber. A few females of *P. littoralis* (Malloch) and a female of *P. punctatellus* sp. nov. have been collected together with their prey, which also consisted of small Jassids.

In the descriptions the term "intercarinal space" indicates the distance between the ventral part of the occipital carina and the posterior part of the hypostomal carina. In some species this space exceeds the width of the basitarsus of the fore legs; usually, however, it is much narrower, rarely the carinae are almost touching. In one or two species the occipital carina does not reach the midventral line, or this carina, at least the lower part of it, is unusually high. The ratio between OOD (distance between posterior ocelli and the oculi) and POD (distance between posterior ocelli) has been roughly indicated. The tempora are usually finely striate, sometimes very finely so. The term "pronotal collar" has been used for the pubescent dorsal part of the pronotum behind the transverse carina. The anterior scutellar suture is usually crenulate, rarely somewhat indistinctly so; in the group of *P. pygmaeus* (*pygmaeus* (Brèthes), *pygmaeus axillaris* subsp. nov. and *facialis* sp. nov.) this suture is simple. The latero-dorsal rows of very short hairs on the petiole are sometimes indistinct, laterally and ventrally the petiole has a number of long erect hairs; the hind margins of the sternites show some long backward directed bristles.

For the figures of the clypeal margin the position of the axis of the microscope ($\times 30$) was perpendicular to the surface of the clypeal disk. As the clypeus is more or less convex, the apical margin may — when seen in ventral aspect — seem to be more emarginate than when seen in frontal aspect and the lateral corners or teeth of the projecting median part may seem to be sharper.

RELATIONSHIPS

An attempt has been made here to split up the genus into species-groups. Many of the species have a very uniform appearance and sometimes closely related

forms are not easily distinguished. A few groups, however, show distinct specialization. In the South American group of *pygmaeus* the axillae are not connected with the disk of the scutellum and they project freely backwards. In *P. joergenseni* the metanotum is peculiarly raised in the middle, especially in the male; the anterior margin of the labrum of the female differs from that of other species. As some species exhibit considerable sexual dimorphism and in many cases the opposite sex is unknown, the arrangement of the species as given below can be no more than a tentative one. Moreover, our knowledge of the geographic distribution of some forms is very incomplete and any decision concerning their status as a distinct species or geographic subspecies may be difficult.

In the enumeration of the species belonging to each group the numbers of specimens examined for this study are also mentioned.

Group of *longiventris*

Characterized in both sexes by the coarsely rugose mesopleura, the female moreover by the lateral pronotal lobes and the male by its large oval tyloidea.

longiventris (Malloch) — 19 ♀ and 65 ♂; Arizona, California; Mexico

Group of *angulicornis*

Antennal tyloidea of males, in as far as they are known, short and mostly oval, in *P. angulicornis* more or less angular in lateral view. In *P. suffusus*, which may belong to a separate group, the tyloidea are small and oval. Clypeal margin of female straight or rounded. Propodeum of female usually finely reticulato-carinate. Mesopleura in both sexes usually reticulate alutaceous and punctate. Petiole of female usually about half as long as first tergite, in a few species nearly as long as this tergite. Intercarinal space of *P. suffusus* broad. Perhaps *P. abbreviatus* also belongs to this group; the males of this species have short, somewhat linear tyloidea.

angulicornis (Malloch) — 5♀ and 5 ♂; Texas, Iowa, Louisiana, New Mexico

pallidistigma (Malloch) — 2 ♀ and 8 ♂; Arizona, California, Texas

basifuscus sp. nov. — 16 ♀ and 26 ♂; Arizona, California, Texas, New Mexico; Mexico

minutus (Malloch) — 2 ♀, ♂ unknown; Texas

spangleri sp. nov. — 42 ♀ and 48 ♂; Arizona, Texas; Mexico; Guatemala

brevipetiolatus (Rohwer) — 2 ♀, ♂ unknown; California

rotundus sp. nov. — 1 ♀, ♂ unknown; Florida

suffusus (Fox) — 41 ♀ and 82 ♂; Arizona, California, Florida, New Mexico, South Carolina, Texas; Mexico

biformis sp. nov. — 1 ♂, ♀ unknown; Mexico

Group of *texanus*

Tyloidea indistinct or absent on antennal segments 8—10 of male. Clypeal margin of female weakly bisinuate. Mesopleura reticulate alutaceous, punctate. Hypo-epimeral area striate. *P. littoralis* seems to be the eastern relative of the Texan species.

texanus (Malloch)	— 2 ♀ and 2 ♂; Texas
littoralis (Malloch)	— 17 ♀ and 23 ♂; Florida, Maryland, North Carolina, South Carolina

Group of *sayi*

Tyloidea of males, as far as known, linear. Clypeal margin of female weakly emarginate or bisinuate. Mesopleura reticulate alutaceous and punctate, rarely shining. Hypo-epimeral area finely punctate, often somewhat shining. Back of propodeum, also in the males of some species (*sayi, abbreviatus, depressus*) finely reticulate. *P. abbreviatus* may have to be transferred to the group of *angulicornis*, as its tyloidea are more elongate oval than linear.

sayi (Rohwer)	— 87 ♀ and 291 ♂; Alabama, Arizona, California, District of Columbia, Florida, Iowa, Kansas, Louisiana, Missouri, New Mexico, South Carolina, Tennessee, Texas, Virginia; Mexico; Cuba; El Salvador; Nicaragua
stenopygidialis sp. nov.	— 2 ♀, ♂ unknown; Arizona
jugularis sp. nov.	— 1 ♀, ♂ unknown; Brazil
punctatellus sp. nov.	— 12 ♀ and 29 ♂; Mexico; Costa Rica; El Salvador; Guatemala
depressus sp. nov.	— 6 ♂, ♀ unknown; Mexico
abbreviatus sp. nov.	— 3 ♀ and 2 ♂; Mexico

Group of *aerofacies*

Tyloidea of male linear. Clypeal margin of female slightly rounded or weakly emarginate. Back of propodeum coarsely reticulato-carinate in both sexes. Mesopleura reticulate alutaceous.

aerofacies (Malloch)	— 6 ♀ and 9 ♂; Texas; Mexico; Belize
evansi sp. nov.	— 3 ♀ and 1 ♂; Mexico
emarginatus sp. nov.	— 1 ♀, ♂ unknown; Mexico

Group of *rufibasis*

Tyloidea of male linear. Clypeal margin of female somewhat rounded. Scutum and mesopleura very coarsely rugose and shining in both sexes.

rufibasis (Malloch) — 21 ♀ and 41 ♂; Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Virginia

Group of *albifacies*

Tyloidea of male linear. Clypeal margin of female somewhat rounded. Mesopleura dull, moderately densely punctate. Hypo-epimeral area dull, densely finely punctate.

albifacies (Malloch) — 14 ♀ and 4 ♂; Iowa, Texas

Group of *tibialis*

Tyloidea of male linear, dark. Clypeal margin of female almost straight. Mesopleura reticulate alutaceous, moderately densely punctate, of male of *arenivagus* sometimes densely punctate. Hypo-epimeral area striate.

tibialis (Cresson) — 18 ♀ and 32 ♂; Alabama, Florida, District of Columbia, Louisiana, Missouri, South Carolina, Tennessee, Texas, Virginia

arenivagus arenivagus Krombein — 11 ♀ and 6 ♂; Florida, Georgia, North Carolina

arenivagus cubanus subsp. nov. — 1 ♀, ♂ unknown; Cuba

Group of *argentifrons*

Tyloidea of male linear. Clypeal margin of female weakly emarginate or bisinuate. Mesopleura dull, usually densely or very densely finely punctate, especially so in the males.

argentifrons (Cresson) — 24 ♀ and 57 ♂; Cuba; Jamaica; Mexico; Nicaragua

atricornis (Malloch) — 4 ♀ and 12 ♂; Puerto Rico; Dominican Republic; Virgin Islands; Leeward Islands

alphitopus sp. nov. — 1 ♀ and 5 ♂; Mexico

castaneipes sp. nov. — 2 ♂, ♀ unknown; New Mexico, Texas

rugulosus sp. nov. — 1 ♂, ♀ unknown; Texas

colonensis sp. nov. — 1 ♀, ♂ unknown; Argentina

fritzi sp. nov. — 1 ♀ and 3 ♂; Ecuador

medius medius (F. Smith) — 5 ♀ and 17 ♂; Argentina; Bolivia; Brazil; Surinam

medius zuliensis subsp. nov. — 39 ♀ and 2 ♂; Venezuela; Curaçao

scytinus sp. nov. — 1 ♀, ♂ unknown; Venezuela

stramineipes sp. nov. — 10 ♀ and 20 ♂; Argentina; Bolivia; Brazil

strigellus sp. nov. — 2 ♀, ♂ unknown; Argentina

Group of *clavicornis*

Antennae of male clavate, no distinct tyloidea. Clypeus of female strongly protruding, snoutlike. Mesopleura very finely reticulate alutaceous, almost shining, no distinct punctures.

clavicornis (Malloch) — 6 ♀ and 141 ♂; Arizona; Mexico

Group of *townsendi*

Antennae of male relatively long and slender, tyloidea not always distinct. Clypeal margin of female weakly emarginate. Mesopleura somewhat dull, indistinctly punctate. All species belonging to this group are South American.

townsendi (Cockerell) — 13 ♀ and 25 ♂; Peru; Ecuador
marthae sp. nov. — 8 ♀ and 11 ♂; Bolivia; Brazil; Colombia; Ecuador; Peru
metanus sp. nov. — 3 ♀ and 2 ♂; Colombia

Group of *nitens*

Tyloidea of male linear or absent, but most of the males are still unknown. Thorax shining, smooth or very finely sparsely punctate, mesopleura rarely very finely alutaceous. The females of *P. occipitalis* and *P. spinicollis* have sharp lateral pronotal angles. The female of *P. trilobatus* is distinguished from other species by the distinctly tridentate clypeal margin. The males of *P. rufanalis, P. araguensis* and *P. incarinatus* have indistinct or no tyloidea. All species are South American.

nitens sp. nov. — 30 ♀ and 30 ♂; Argentina; Bolivia; Brazil; Colombia; Ecuador; Paraguay; Peru; Surinam; Venezuela
duckei sp. nov. — 2 ♀, ♂ unknown; Brazil
obscurus sp. nov. — 1 ♀, ♂ unknown; Argentina
zonatus sp. nov. — 2 ♀, ♂ unknown; Brazil
simplicicollis sp. nov. — 1 ♀, ♂ unknown; Brazil
menkei sp. nov. — 1 ♀, ♂ unknown; Venezuela
occipitalis sp. nov. — 1 ♀, ♂ unknown; Peru
spinicollis sp. nov. — 4 ♀, ♂ unknown; Brazil; Panama
trilobatus sp. nov. — 6 ♀ and 3 ♂; Ecuador, Peru, Surinam
rufanalis sp. nov. — 5 ♀ and 28 ♂; Peru
araguensis sp. nov. — 3 ♀ and 3 ♂; Venezuela
incarinatus sp. nov. — 1 ♂, ♀ unknown; Venezuela

Group of *annulipes*

Large species, pronotal collar with large lateral lobes or projections. Tyloidea of male linear. Clypeal margin of female weakly emarginate or weakly quadridentate.

Mesopleura smooth and shining. *P. annulipes* and *P. smithii* are very closely related and may be conspecific; *P. smithii* seems to have many geographic forms.

annulipes (Cameron) — 21 ♀ and 9 ♂; Mexico; Costa Rica; El Salvador

smithii (Fox) — 30 ♀ and 45 ♂; Argentina; Bolivia; Brazil; Colombia; Panama Canal Zone; Paraguay; Surinam; Venezuela

denticollis sp. nov. — 1 ♀, ♂ unknown; Peru

Group of *pygmaeus*

Axillae posteriorly free, inner side not connected with scutellum. Anterior suture of scutellum without distinct carinae (not crenulate). Tyloidea of male linear. Mesopleura almost smooth. Clypeal margin of female weakly emarginate in *P. pygmaeus* and its subspecies *axillaris*, in *P. facialis* the clypeus of the female is deeply emarginate, the median part of the clypeus of the male is also raised and protruding.

pygmaeus pygmaeus (Brèthes) — 76 ♀ and 31 ♂; Argentina; Bolivia; Peru

pygmaeus axillaris subsp. nov. — 33 ♀ and 19 ♂, Bolivia; Brazil; British Guyana; Colombia; Surinam

facialis sp. nov. — 1 ♀ and 9 ♂; Colombia

Group of *joergenseni*

Metanotum raised in the middle, forming two "wings", notably in the male. Tyloidea of male linear. Clypeus of female with large lateral teeth, those of the male too are relatively large. Labrum of female with many small teeth on anterior margin (fig. 68), labrum of male (fig. 69) with four blunt teeth only. Mesopleura reticulate alutaceous, punctate.

joergenseni (Brèthes) — 44 ♀ and 46 ♂; Argentina; Bolivia; Brazil; Paraguay

Key to the species of the genus *Pluto*

1. Females (unknown: *biformis*, *castaneipes*, *depressus*, *incarinatus* and *rugulosus*) 2

— Males (unknown: *arenivagus cubanus*, *brevipetiolatus*, *colonensis*, *denticollis*, *duckei*, *emarginatus*, *jugularis*, *menkei*, *minutus*, *obscurus*, *occipitalis*, *rotundus*, *scytinus*, *simplicicollis*, *spinicollis*, *stenopygidialis*, *strigellus* and *zonatus*) . . 60

2. Lateral pronotal angles with long elongate-lobular projection. Clypeal margin almost straight. Mesopleura and scutum smooth, sparsely finely punctate. Petiole about as long as tergite 1. Gaster black, at most hind margin of tergite 1 distinctly red. Length 10—13 mm 3

— Lateral pronotal angles not long elongate-lobular, at most with equilateral-triangular projection and then clypeal margin not straight, or pronotal projections small and tergites 1—3 red. Smaller 130

3. Basitarsus and second tarsal segment of hind legs whitish. At least outer side of fore tibiae black, base ivory-white on outer side, foreside reddish-brown. Base of hind tibiae largely whitish. Pronotal tubercles dark brown or black. Gaster black. Face pale golden. Mexico; Costa Rica; El Salvador . . . . *annulipes* (Cameron) (p. 224)

— Hind basitarsus and segments 2—3 or 2—4 of hind tarsi whitish. Outer side of fore tibiae entirely reddish or with dark streak on posterior surface only, foreside often yellowish. Base of hind tibiae with many small, brownish thorns (except in Argentine form C). Pronotal tubercles reddish or reddish-yellow, rarely brown or black. Narrow hind margin of tergite 1 sometimes reddish. Face golden. Argentina; Bolivia; Brazil; Colombia; Panama Canal Zone; Paraguay; Surinam; Venezuela . . . . *smithii* (Fox) (p. 226)

4. Upper part of mesopleura with some longitudinal rugae, lower part sparsely punctate. Hypo-epimeral area rugoso-punctate. Scutum shining, sparsely punctate. Lateral pronotal angles sharp in dorsal view; pronotal tubercles whitish. Petiole about half as long as tergite 1. Intercarinal space as wide as fore basitarsus. Gaster black, margins of tergites reddish transparent. Underside of flagellum pale yellowish. Hind tarsi whitish. Face silvery. Length 9—9.5 mm. Arizona, California; Mexico . . . . *longiventris* (Malloch) (p. 154)

— Upper part of mesopleura not coarsely rugose, or mesopleura rugoso-punctate and also scutum with coarse rugae or hind tarsi dark brown. Smaller 5

5. Clypeus with long snoutlike projection, apex bidentate. Lateral pronotal angles sharp. Mesopleura very finely alutaceous, sparsely finely punctate. Petiole about as long as tergite 1. Gaster black, pronotal tubercles whitish, all tarsi yellowish. Arizona; Mexico . . . . *clavicornis* (Malloch) (p. 206)

— Clypeus not much snoutlike protruding 6

6. Clypeal margin widely emarginate, large lateral teeth. Intercarinal space much broader than fore basitarsus. Mesopleura finely alutaceous, scutum sparsely punctate, mesopleura more densely so, interstices here a few times size of punctures. Metanotum laterally somewhat depressed. Petiole about as long as tergite 1. Hind margin of tergite 1 and all of tergite 2 red. Hind tarsal segments 1—4 yellowish-white. Argentina; Bolivia; Brazil; Paraguay . . . . *joergenseni* (Brèthes) (p. 235)

— Clypeal margin at most with small teeth or lobes, sometimes more or less deeply emarginate 7

7. Axillae posteriorly not connected with scutellum. Back of propodeum coarsely reticulato-carinate; enclosure with large median area. Petiole about as long as tergite 1. Gaster black 8

— Axillae posteriorly normally connected with scutellum 10

8. Clypeal margin thick, very deeply, almost rectangularly emarginate, exposing

labrum. Back of propodeum very coarsely reticulate, carinae high, enclosure deep. Dorsal half of mesopleura finely alutaceous, sparsely finely punctate. Hind tarsi brown. Face pale golden or yellowish-silvery pubescent. Colombia . . . . *facialis* sp. nov. (p. 234)

— Clypeal margin not unusually deeply emarginate. Propodeal carinae normal 9

9. Scutum on anterior part, scutellum and mesopleura slightly alutaceous. Mesopleura and scutum also sparsely finely punctate, scutellum more densely so. Back of head somewhat alutaceous. Clypeal margin slightly emarginate with distinct small lateral angles. Hind tarsal segments except apices brown. Face usually silvery, sometimes golden pubescent. Argentina; Bolivia; Peru . . . . *pygmaeus pygmaeus* (Brèthes) (p. 230)

— Scutum and scutellum smooth and shining, sparsely finely punctate, interstices on scutellum a few times size of punctures. Mesopleura slightly or not alutaceous. Back of head smooth and shining. Clypeal margin almost straight, no distinct lateral angles. Hind tarsi brown or yellowish-brown. Face usually silvery, rarely golden. Bolivia; Brazil; British Guyana; Colombia; Surinam . . . . *pygmaeus axillaris* subsp. nov. (p. 233)

10. Face golden, rarely silvery. Tergite 2 or tergites 2—3 red. Clypeal margin with small lateral teeth and more or less distinct median tooth. Vertex with broad transverse depression between ocelli and oculi. Mesopleura finely alutaceous, rarely shining, and very finely punctate. Propodeum coarsely reticulate. Petiole as long as tergite 1 11

— Not all these characters combined 12

11. Face golden (silvery in females from Argentina and Bolivia). Median clypeal tooth indistinct. Hind margin of tergite 1, all of tergite 2 and sides of tergite 3, or all of tergites 2—3 red. Labrum reddish. Apical 2/3 of hind basitarsus yellowish-white. Argentina; Bolivia; Brazil; Surinam . . . . *medius medius* (Smith) (p. 200)

— Face deep golden. Median clypeal tooth more distinct. Tergite 1 except for two black marks, all of tergites 2—3 and sides of tergite 4 red. Labrum black. Hind tarsi almost entirely dark brown. Curaçao; Venezuela . . . . *medius zuliensis* subsp. nov. (p. 202)

12. Mesopleura including hind margin and hypo-epimeral area shining or superficially alutaceous (× 30), hind margin of mesopleura not rugulose or coriaceous, at most with some shining short rugae. Hind tarsal segments 1—4 brown or reddish-yellow, rarely whitish. Punctation of mesopleura very fine and sparse or very indistinct and mesopleura densely pubescent; if punctation more distinct then lateral pronotal angles very sharp and hind tarsal segments whitish (cf. *araguensis*). Intercarinal space not wider than fore basitarsus . 13

— Mesopleura usually distinctly alutaceous and/or punctate or coarsely rugoso-punctate; if very finely punctate or somewhat shining, then punctation close or hind margin rugulose or coriaceous, or lateral pronotal angles not very sharp or hind tarsal segments 1—4 whitish. Intercarinal space sometimes wider than fore basitarsus 28

13. Clypeal margin more or less trilobate or tridentate, median tooth sometimes very small. Occipital carina not connected with hypostomal carina. Scutum and scutellum dull. Mesopleura smooth and shining, impunctate or indistinctly punctate. Petiole as long as tergite 1 or slightly longer. Pronotal tubercles and gaster black, hind tarsi brown 14
— Clypeal margin not distinctly trilobate or tridentate, if indistinctly so then gaster largely red 15
14. Clypeal margin with projecting shining median lobe and distinct triangular lateral teeth. Pygidial area little longer than broad. Last gastral segment dark brown. Face silvery. Ecuador; Peru; Surinam . . *trilobatus* sp. nov. (p. 218)
— Median tooth of clypeal margin very small. Punctation of scutum weaker than in preceding form. Pygidial area about 1.5 times as long as broad. Last gastral segment reddish. Face silvery. Male unknown. Peru . . . . sp. aff. *trilobatus*? (p. 220)
15. Clypeal margin with four distinct short lobes. Pronotal collar laterally with large equilateral-triangular lobes, projecting forward. Mesopleura and scutum smooth and shining. Petiole about as long as tergite 1. Underside of flagellum orange-red. Gaster black. Pubescence of face golden, of dorsal side of thorax brownish-golden. Male unknown. Peru *denticollis* sp. nov. (p. 229)
— Clypeal lobes, if any, indistinct. Pronotum not with large triangular lobes, angles at most sharp or with small triangular tooth or one or more of gastral tergites 1—3 red 16
16. One or more gastral tergites largely or entirely red 17
— Gaster black, at most hind margins of tergites and base of tergite 2 reddish or yellowish transparent. Petiole about as long as or 4/5 length of tergite 1. Hind tarsi, at least segments 2—5 brownish or reddish 22
17. Lateral pronotal angles projecting as a sharp tooth or spine. Mesopleura finely alutaceous, almost smooth, finely but distinctly punctate, hypo-epimeral area shining, indistinctly punctate. Clypeal margin not distinctly dentate. Petiole slightly over half length of tergite 1. Tergites 1—3 except for extreme base of tergite 1 red. Hind tarsi yellowish-brown. Male unknown. Brazil; Panama . . . . *spinicollis* sp. nov. (p. 217)
— Pronotum not with distinct lateral spines. Tergite 1 more extensively darkened 18
18. Mesopleura and hypo-epimeral area smooth and shining 19
— Mesopleura relatively dull owing to fine reticulation and many, sometimes indistinct, hairbearing punctures. At least tergites 2—3 red 21
19. Petiole about as long as tergite 1. Clypeal emargination about half total width. Occipital carina not distinctly connected with hypostomal carina. Propodeum with long oblique striae; enclosure shining, with large median area. Narrow margin of tergite 1, all of tergite 2, basal half of tergite 3 and sternites 2—3 red. Hind tarsal segments 1—4 yellowish-red. Face silvery. Male unknown. Brazil . . . . *duckei* sp. nov. (p. 212)
— Petiole about 2/3 length of tergite 1. Clypeal emargination about 1/3 of total width or indistinctly quadridentate. Occipital carina distinct. Propodeum

reticulate, dorso-laterally with parallel carinae. Narrow margin of tergite 1, all or nearly all of tergite 2 and sternite 2 red 20

20. Face pale golden. Clypeal margin indistinctly quadridentate, this part about half total width. Antennal segments 10—11 shorter than broad. Scutum shining, very sparsely punctate. Hind tarsi brownish-red or yellowish-red. Male unknown. Brazil . . . . *zonatus* sp. nov. (p. 215)
— Face silvery. Clypeal margin with weak emargination, about 1/3 of total width. Antennal segments 10—11 about as long as broad. Scutum shining, more densely punctate. Hind tarsi dark brown, apices paler. Male unknown. Venezuela . . . . *menkei* sp. nov. (p. 216)

21. Petiole distinctly shorter than tergite 1. Propodeum dorso-laterally almost smooth, lower part weakly reticulato-carinate. Tergite 2 entirely red, tergite 3 entirely or nearly entirely so. Hind tarsi brown. Ecuador; Peru . . . . *townsendi* (Cockerell) (p. 207)
— Petiole as long as or slightly longer than tergite 1. Back of propodeum relatively coarsely reticulato-carinate, carinae dorso-laterally mostly parallel. Apical half of tergite 1 and remainder of gaster red, bases of tergites 4—6 sometimes brownish. Hind tarsi brown. Bolivia; Brazil; Colombia; Ecuador; Peru . . . . *marthae* sp. nov. (p. 208)

22. Mesopleura and hypo-epimeral area somewhat dull, finely, rather densely, punctate. Pronotal tubercles whitish 23
— Mesopleura and hypo-epimeral area smooth and shining, or very indistinctly alutaceous, sparsely very finely punctate. Pronotal tubercles whitish or brown 24

23. Lateral pronotal angles rectangular. Mesopleura and hypo-epimeral area with indistinct, rather dense punctation. Scutum shining. Gaster black with reddish hind margins of tergites and narrow red base of tergite 2. Hind tarsi brown. Colombia . . . . *metanus* sp. nov. (p. 210)
— Lateral pronotal angles sharp, protruding laterally. Mesopleura finely reticulate alutaceous, finely but distinctly punctate, interstices a few times size of punctures. Hypo-epimeral area somewhat shining, indistinctly punctate. Scutum finely reticulate alutaceous, punctures stronger than on mesopleura, interstices a few times size of punctures. Hind tarsal segments 1—4 whitish. Male unknown. Venezuela . . . . *araguensis* sp. nov. (p. 221)

24. Pronotal tubercles brown or black 25
— Pronotal tubercles whitish or yellowish-white. Frons somewhat raised, also in front of anterior ocellus 27

25. Lateral pronotal angles obtuse. Median part of clypeal margin with distinct narrow shining depression, very slightly widely emarginate. Back of propodeum almost dull, with long parallel carinae; enclosure shining. Frons not distinctly raised before anterior ocellus. Hind tarsi brown, at least segments 2—5. Face silvery. Argentina; Bolivia; Brazil; Ecuador; Paraguay; Peru; Surinam; Venezuela . . . . *nitens* sp. nov. (p. 210)
— Lateral pronotal angles sharp or rectangular, not distinctly protruding. Clypeal margin with four indistinct lobes or nearly straight. Frons distinctly

raised around anterior ocellus. Back of propodeum somewhat shining, coarsely reticulato-carinate, dorso-laterally with some oblique carinae . 26

26. Antennal segments 9—11 shorter than broad. Clypeal margin with four indistinct lobes. Underside of flagellum orange. Hind tarsi reddish, segments 2—4 slightly darkened. Fore tibiae entirely yellowish-red. Face pale golden. Male unknown. Brazil . . . . *simplicicollis* sp. nov. (p. 215)

— Antennal segments 9—11 distinctly longer than broad. Clypeal margin straight. Flagellum except for underside of last segment blackish-brown. Foreside of fore tibiae reddish-brown. Hind tibiae including base and all of hind tarsi dark brown. Face silvery appressed pubescent and also with long erect brownish hairs. Larger, about 9.5 mm. Male unknown. Argentina . . . . *obscurus* sp. nov. (p. 214)

27. Lateral pronotal angles sharp, in antero-lateral view distinctly protruding. Lateral parts of occipital carina broadened, transparent, in dorsal view as high as pubescence of tempora. Median part of clypeal margin not depressed, reddish. Hind tarsal segments 1—4 yellowish, apices somewhat brown. Face silvery. Male unknown. Peru . . . . *occipitalis* sp. nov. (p. 217)

— Lateral pronotal angles rectangular. Occipital carina of normal height. Median part of clypeal margin distinctly depressed. Last tergite reddish. Hind tarsal segments 1—4 whitish. Face pale golden. Peru . . . . *rufanalis* sp. nov. (p. 220)

28. Mesopleura entirely distinctly and closely finely punctate, interstices smaller than punctures, sometimes interstices below somewhat larger or middle part finely striato-punctate. If mesopleura almost indistinctly punctate and striate and tergite 2 red, cf. *strigellus*. Petiole between half and 3/5 length of tergite 1, if longer, then cf. *albifacies*, No. 55. Face silvery 29

— Mesopleura with interstices at least on upper part largely about size of punctures or larger, or upper part of mesopleura more coarsely punctate, rugoso-punctate or rugulose, or face more or less golden or petiole longer 34

29. Pronotal tubercles black. Face pale golden. Gaster black. Hind tarsal segments 1—4 yellowish-brown, segments 1—3 with darker base. Mesopleura dull, densely finely punctate, upper part also finely striate. Propodeum dull, dorsal half with fine oblique carinae. Mexico . . *alphitopus* sp. nov. (p. 195)

— Pronotal tubercles whitish. Face silvery 30

30. Gaster black, at most sides and hind margins of tergites 2—3 and of sternites 2—3 red 31

— At least tergite 2 entirely red 32

31. Hind tarsi whitish. Mesopleura dull, distinctly finely punctate, interstices on lower part often larger than punctures. Petiole about 2/3 length of tergite 1. Argentina; Bolivia; Brazil . . . . *stramineipes* sp. nov. (p. 204)

— Hind tarsi brown. Mesopleura very densely finely punctate, partly striato-punctate. Scutum distinctly but finely, not sparsely punctate. Petiole about half length tergite 1. Cuba; Jamaica; Nicaragua; Mexico . . . . *argentifrons* (Cresson) (p. 192)

32. Scutum shining, central part sparsely finely punctate. Upper half of mesopleura dull, very finely almost indistinctly punctate and extremely finely longitudinally striate; lower half somewhat shining, interstices about size of punctures. Apical half of tergite 1, all of tergite 2 and most of tergite 3 red. Hind tarsi brown. Male unknown. Argentina . . . *strigellus* sp. nov. (p. 205)
— Scutum more densely or strongly punctate. Punctation of mesopleura fine but distinct, no striae 33
33. Scutum densely and regularly finely punctate. Clypeal margin slightly emarginate, somewhat depressed with trace of median tooth. Mesopleura dull, very closely and finely punctate. Hind tarsi yellowish, very slightly brownish darkened. Hind margin of tergite 1 and all of tergites 2—3 red. Male unknown. Venezuela . . . . *scytinus* sp. nov. (p. 203)
— Scutum strongly punctate, hind margin rugulose. Clypeal margin weakly emarginate, no trace of median tooth. Mesopleura dull, densely, somewhat stronger punctate. Hind tarsi brown, apices paler. Hind margin of tergite 1, all of tergite 2 and base of 3 red. Male unknown. Argentina . . . . *colonensis* sp. nov. (p. 198)
34. Scutum and scutellum with strong, shining, irregular rugae and also strongly punctate. Mesopleura dull, upper half at least anteriorly coarsely rugoso-punctate, punctures large, lower half not rugose and interstices larger than punctures. Petiole red or black, nearly as long as tergite 1. At least tergite 2 and hind margins of following segments more or less red, sometimes tergites 1—2 entirely red. Tarsal segments 1—4 whitish-yellow. Face pale golden. Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Virginia . . . . *rufibasis* (Malloch) (p. 186)
— Scutum not with strong rurae. Sculpture of mesopleura usually finer. Petiole never red 35
35. Hind tarsi largely brown or orange-brown, apices of segments often paler. If basitarsus yellowish-white, then face golden 36
— Hind tarsi whitish or yellowish, usually last segment brown; if all tarsal segments partly brownish, gaster entirely black, pronotal tubercles whitish and propodeum coarsely reticulate, cf. *evansi* 47
36. Pronotal tubercles dark brown or black. Gaster black, at most hind margins of tergites reddish 37
— Pronotal tubercles whitish. Gaster not always black 40
37. Face dark brown-golden pubescent, leaving sculpture of clypeus well visible. Punctation of mesopleura irregular, distinct on uppe iart, almost absent on lower part. Back of propodeum very finely carinate, most carinae obliuuê iarallel. Petiole about half length of tergite 1. Pygidial area over 2.5 times as long as broad. All tarsi entirely brown. Male unknown. Arizona . . . . *stenopygidialis* sp. nov. (p. 176)
— Face normally and appressed, densely silvery or golden pubescent. Fore and mid tarsi yellowish-brown, yellowish or whitish, hind tarsi brown or orange-brown. Petiole longer 38
38. Clypeal margin widely, shallowly emarginate, with distinct lateral teeth.

Mesopleura and hypo-epimeral area indistinctly alutaceous, somewhat shining. Mesopleura irregularly sparsely punctate, hypo-epimeral area more densely punctate. Back of propodeum coarsely reticulate, carinae dorso-laterally oblique. Petiole about 2/3 length of tergite 1. Face silvery. Male unknown. Mexico . . . . *emarginatus* sp. nov. (p. 185)

— Median part of clypeal margin almost straight or slightly rounded. Mesopleura more densely punctate, very finely alutaceous 39

39. Mesopleura regularly, moderately densely punctate, hypo-epimeral area finely alutaceous, very finely punctate. Scutum and scutellum finely alutaceous, sparsely punctate. Back of propodeum dull, finely reticulate, dorso-lateral carinae oblique. Petiole about 2/3 length of tergite 1. Hind tarsi orange-brown. Face silvery, yellowish-silvery or golden. Costa Rica; El Salvador; Guatemala; Mexico . . . . *punctatellus* sp. nov. (p. 179)

— Mesopleura stronger, more irregularly, moderately densely punctate; hypo-epimeral area shining, very finely punctate. Scutum and scutellum smooth and shining, moderately densely punctate. Back of propodeum shining, coarsely reticulate. Petiole about as long as tergite 1. Face golden. Ecuador . . . . *fritzi* sp. nov. (p. 199)

40. Gaster black. Mesopleura on upper part obliquely rugulose, below finely punctate, interstices there size of punctures, or larger. Scutum shining, finely, not densely punctate. Intercarinal space almost as wide as fore basitarsus. Puerto Rico; Dominican Republic; Haiti; Leeward Islands; Virgin Islands . . . . *atricornis* (Malloch) (p. 194)

— At least tergite 2 more or less red. Sculpture of mesopleura finer, not distinctly rugulose or striato-punctate 41

41. Hypo-epimeral area punctate and with longitudinal striae or rugae, sometimes most distinct from behind. Scutum shining, finely punctate. Petiole 2/3 to 3/4 length of tergite 1. Hind margin of tergite 1, all of tergite 2 and base of tergite 3 red. Face silvery 42

— Hypo-epimeral area not with distinct striae or rugae, more or less densely punctate. Face sometimes golden 43

42. Mesopleura indistinctly alutaceous, somewhat shining, finely punctate, interstices a few times size of punctures, hind margin coriaceous and with fine striae. Hypo-epimeral area ruguloso-punctate. Texas . . . . *texanus* (Malloch) (p. 170)

— Mesopleura more distinctly alutaceous, distinctly punctate, interstices mostly about size of punctures, hind margin granulose. Hypo-epimeral area with coarse rugae, punctures finer. Florida, Maryland, North Carolina, South Carolina . . . . *littoralis* (Malloch) (p. 171)

43. Petiole nearly as long as tergite 1. Intercarinal space broader than first basitarsus. Mesopleura indistinctly punctate, interstices a few times size of punctures. Punctation of hypo-epimeral area imperceptible with enlargement × 30. Scutum and scutellum finely alutaceous. Back of propodeum moderately finely reticulato-carinate. Hind margin of tergite 1 and all of tergites 2—3 red. Face silvery. Male unknown. Brazil . . . .

. . . . *jugularis* sp. nov. (p. 178)

— Petiole at most 2/3 length of tergite 1. Intercarinal space less broad than first basitarsus. Back of propodeum finely reticulato-carinate, sometimes dorso-laterally with fine oblique striae 44

44. Hypo-epimeral area almost shining, distinctly finely punctate, interstices about size of punctures. Scutum usually shining, medially sharply punctate. Mesopleura dull, finely alutaceous and punctate. Petiole about 2/3 length of tergite 1. Pygidial area about twice as long as broad. Hind margin of tergite 1, all of tergite 2 and all or at least base of tergite 3 red. Alabama, California, District of Columbia, Florida, Iowa, Louisiana, Mississippi, New Mexico, North Carolina, South Carolina, Tennessee; El Salvador; Mexico; Nicaragua . . . . *sayi* (Rohwer) (p. 173)

— Hypo-epimeral area dull, densely finely or indistinctly punctate. Scutum finely reticulate alutaceous or pygidial area narrow, about three times as long as broad 45

45. Hind margin of tergite 1 and all of tergites 2—6 red. Scutum sparsely punctate. Mesopleura reticulate alutaceous, irregularly, partly closely, finely punctate. Petiole about 2/3 length of tergite 1. Mexico: Baja California . . . . *abbreviatus* sp. nov. (p. 182)

— Not tergites 4—6 entirely red. Petiole about half length of first tergite . . 46

46. Hypo-epimeral area dull, granulose, indistinctly finely and closely punctate. Pygidial area narrow, about three times as long as broad. Scutum and scutellum shining, indistinctly alutaceous, sparsely punctate. Mesopleura finely alutaceous, anteriorly sparsely finely punctate. Intercarinal space nearly as broad as fore basitarsus. Apex of tergite 2 and at least base of tergite 3 red. Hind tarsal segments 1—4 pale brown, apices paler. Male unknown. California (cf. also No. 52) . . . . *brevipetiolatus* (Malloch) (p. 164)

— Hypo-epimeral area distinctly punctate, interstices mostly smaller than punctures. Pygidial area about 2.5 times as long as broad. Scutum alutaceous. Mesopleura finely alutaceous, punctate, interstices mostly a few times size of punctures. Intercarinal space narrower. Tergite 2 usually entirely red. Hind tarsal segments 2—4 more or less brown, basitarsus for greater part so. Arizona, California, Texas, New Mexico; Mexico (for pale-legged form, cf. also No. 54) . . . . *basifuscus* sp. nov. (p. 160)

47. Gaster more or less red, usually tergite 2 or 3 entirely so; if only apex of tergite 2 or base of tergite 3 red, then petiole short or intercarinal space as wide as fore basitarsus 48

— Gaster black, at most hind margins of tergites or sides of tergites 2—3 and sternites 2—3 somewhat reddish or yellowish transparent, or last tergite reddish. Intercarinal space not as wide as fore basitarsus 55

48. Intercarinal space very narrow, occipital carina and hypostomal carina almost touching. Petiole 2/3 or 3/4 length of tergite 1. Back of propodeum reticulato-carinate, dorso-laterally some fine oblique parallel carinae. Median part of clypeal margin about straight 49

— Intercarinal space wider or petiole about half as long as tergite 1 or clypeal

margin distinctly rounded 50

49. Hypo-epimeral area dull, finely punctate, posteriorly indistinctly striate. Mesopleura alutaceous, punctures moderately large, mostly contiguous, on median part striato-punctate; punctures below somewhat finer, interstices mostly smaller than punctures. Scutum shining, strongly punctate, interstices mostly smaller than punctures. Fore and mid tibiae yellowish-red. Hind margin of tergite 1, all of tergite 2 and at least base of tergite 3 reddish. Florida, Georgia, North Carolina *arenivagus arenivagus* Krombein (p. 190)

— Hypo-epimeral area entirely distinctly longitudinally striate and punctate. Mesopleura somewhat more coarsely punctate. Punctation of scutum finer, interstices mostly twice as large as punctures. Fore tibiae brown below, mid tibiae dark brown below. Base of tergite 2 darkened, tergite 3 entirely red. Male unknown. Cuba . . . . *arenivagus cubanus* subsp. nov. (p. 192)

50. Petiole about 2/3 or 3/4 length of tergite 1. Back of propodeum reticulato-carinate, carinae dorso-laterally somewhat parallel 51

— Petiole about half as long as tergite 1. Back of propodeum finely densely reticulato-carinate, upper part finely striate 52

51. Intercarinal space as wide as fore basitarsus. Mesopleura with moderately large, shallow punctures, interstices on upper part as large as or larger than punctures, punctures medially partly in rows, interstices below wider. Scutum sparsely punctate. Clypeal margin almost straight. Apex of tergite 2 and usually all of tergite 3 red. Arizona, California, Florida, New Mexico, South Carolina, Texas; Mexico . . . . *suffusus* (Fox) (p. 166)

— Intercarinal space about half width fore basitarsus. Mesopleura with regularly placed small punctures, interstices mostly a few times size of punctures. Scutum more densely punctate. Clypeal margin rounded, reddish. Tergites 1—3 red. Male unknown. Florida . . . . *rotundus* sp. nov. (p. 165)

52. Hypo-epimeral area dull, granulose, indistinctly finely and closely punctate. Pygidial area narrow, about three times as long as broad. Mesopleura finely alutaceous, anteriorly sparsely finely punctate. Scutum and scutellum shining, indistinctly alutaceous, sparsely punctate. Intercarinal space nearly as broad as fore basitarsus. Apex of tergite 2 and base of tergite 3 red. Hind tarsal segments 1—4 indistinctly brownish, apices paler. Male unknown. California . . . . *brevipetiolatus* (Malloch) (p. 164)

— Hypo-epimeral area distinctly punctate. Pygidial area less than three times as long as broad. Tergite 2 usually entirely red 53

53. Hypo-epimeral area somewhat glossy, finely punctate, interstices at least size of punctures or larger. Mesopleura finely alutaceous, finely punctate, on median part interstices mostly not much larger than punctures, on upper part much larger. Scutum and scutellum shining, punctate, interstices mostly a few times size of punctures. Hind tarsal segments 1—4 yellowish-white. Iowa, Louisiana, New Mexico, Texas . . . . *angulicornis* (Malloch) (p. 157)

— Hypo-epimeral area dull, distinctly punctate, interstices mostly smaller than punctures. Mesopleura finely alutaceous, punctate, interstices mostly a few times size of punctures. Scutum finely alutaceous, sparsely punctate . . . 54

54. All tarsi including last segment whitish; extreme base of hind basitarsus brownish. Arizona, California, Texas . . . . *pallidistigma* (Malloch) (p. 158)
— Tarsi whitish, base of hind basitarsus and last segment of hind tarsi brown (or 3/4 of hind basitarsus and bases of hind tarsal segments 2—4 brown; cf. No. 46). Arizona, California, Texas, New Mexico; Mexico . . . . *basifuscus* sp. nov. (p. 160)
55. Petiole nearly as long as tergite 1. Mesopleura dull or weakly shining, punctate, interstices about size of punctures. Propodeum reticulato-carinate with fine laero-dorsal oblique striae. Hypo-epimeral area dull, densely very finely punctate. Sides of tergites 2—3 and all of sternites 2—3 sometimes red or reddish-brown. Face densely silvery pubescent. Iowa, Texas . . . . *albifacies* (Malloch) (p. 187)
— Petiole distinctly shorter than tergite 1 or mesopleura strongly punctate 56
56. Back of propodeum dull, with faint striae, lower part of back not distinctly reticulate. Mesopleura finely alutaceous, punctures on upper part relatively large and superficial, lower part very sparsely punctate. Hypo-epimeral area densely superficially punctate. Petiole about half length tergite 1 or shorter. Face silvery. Length 5 mm. Male unknown. Texas . . . . *minutus* (Malloch) (p. 162)
— Sculpture of propodeum coarser or propodeum distinctly reticulate. Mesopleura more regularly, sometimes sparsely punctate. Length 6—7 mm 57
57. Face brassy yellow or pale golden. Petiole about 2/3 of length of tergite 1. Mesopleura dull, on median part with shallow, partly moderately large punctures, lower part with finer, widely placed punctures, below hypo-epimeral area some very wide interstices. Hypo-epimeral area densely finely punctate. Scutum strongly punctate, partly rugose. Back of propodeum coarsely reticulato-carinate. Outer side of tibiae yellowish. Texas, North Carolina; Belize; Mexico . . . . *aerofacies* (Malloch) (p. 183)
— Face silvery. Petiole about half length of tergite 1 or little longer 58
58. Mid tibiae largely brown, not yellowish-white on outer side. Scutum and scutellum finely alutaceous, sparsely distinctly punctate. Back of propodeum coarsely reticulato-carinate. Mesopleura finely punctate, interstices a few times size of punctures. Hypo-epimeral area very finely punctate, interstices larger than punctures. Hind tarsi whitish, base of basitarsus and last tarsal segment brown, sometimes also segments 3—4 darkened. Mexico . . . . *evansi* sp. nov. (p. 184)
— Mid tibiae whitish on outer side. Segments 1—4 of hind tarsi whitish . . . 59
59. Mesopleura with large punctures, partly in longitudinal rows; interstices partly as large as or larger than punctures. Intercarinal space linear. Scutum shining, strongly punctate. Propodeal enclosure irregularly reticulate. Hypo-epimeral area strongly longitudinally striato-punctate. District of Columbia, Florida, Louisiana, Missouri, South Carolina, Tennessee, Texas, Virginia . . . . *tibialis* (Cresson) (p. 188)
— Mesopleura with distinct but finer punctures, interstices mostly larger than

punctures, below a few times size of punctures. Intercarinal space more than half as wide as fore basitarsus, rarely narrower. Scutum finely alutaceous, finely punctate. Propodeal enclosure usually shining, with large median area. Hypo-epimeral area finely punctate, interstices about size of punctures. Arizona, Texas, Mexico, Guatemala . . . . *spangleri* sp.nov. (p. 162)

60. Lateral pronotal angles with long lobular projection. Large species . . . 61
— Lateral pronotal angles not with long lobular projection 62
61. Hind basitarsus, sometimes also mid basitarsus, whitish, following segments dark. Antennal segments 5—11 or 5—12 with linear tyloides, at most half as long as segment. Pronotal tubercles dark brown, at most with paler hind margin. Base of tergite 2 black. Fore tibiae with black streak on outer side, base yellowish-white. Scape of antennae black. Face silvery pubescent. Mexico; Costa Rica . . . . *annulipes* (Cameron) (p. 224)
— Hind basitarsus and tarsal segments 2—3 or 2—4 whitish. Usually antennal segments 4—13 or 5—13 with linear tyloides (if only segments 5—11 with tyloidea, then cf. *smithii* form D). Pronotal tubercles reddish or yellowish-red. Tergites 1—2 largely red or only base of tergite 2 red. Fore tibiae entirely reddish. Scape of antennae black or reddish. Face silvery or pale golden. Argentina; Bolivia; Brazil; Colombia; Panama Canal Zone; Paraguay; Surinam . . . . *smithii* (Fox) (p. 226)
6?. Antennae strongly clavate, segments 10—12 shorter than broad, no tyloidea. Mesopleura, hypo-epimeral area and scutum shining, mesopleura indistinctly alutaceous, sparsely punctate. Lateral pronotal angles sharp. Petiole about as long as tergite 1. Gaster black, hind margins of tergites reddish. Hind tarsi pale yellowish-brown. Arizona; Mexico . . . . *clavicornis* (Malloch) (p. 206)
— Antennae not strongly clavate 63
63. Tyloidea partly oval, at most linear on segments 4—5 or 4—8, or tyloidea interrupted on segments 8—10 64
— Tyloidea all linear or all tyloidea indistinct or absent (cf. also *abbreviatus*) 73
64. Mesopleura and hypo-epimeral area very coarsely rugose, punctures indistinct. Scutum shining, a few coarse punctures or scutum rugoso-punctate. Antennal segments 6—12 with large oval tyloides, a small one on segment 13. Intercarinal space about as wide as fore basitarsus. Petiole about as long as tergite 1. Hind tarsal segments 1—4 whitish. Arizona, California; Mexico . . . . *longiventris* (Malloch) (p. 154)
— Mesopleura distinctly coarsely punctate and rugoso-punctate, tyloidea small and intercarinal space wide, or mesopleura punctate only, mostly with distinct interstices between punctures 65
65. Mesopleura coarsely striato-punctate or rugoso-punctate, hypo-epimeral area distinctly punctate. Scutum coarsely punctate with tendency to transverse rugosity. Petiole about as long as tergite 1. Antennal segments 5—13 with small oval tylidea. Intercarinal space about as wide as fore basitarsus. Gaster black, hind margins of tergites reddish. Hind tarsal segments 1—4 whitish. Arizona, California, Florida, New Mexico, South Carolina, Texas; Mexico . . . . *suffusus* (Fox) (p. 166)

— Distinct interstices between punctures of mesopleura, at least on lower part. Scutum less coarsely punctate. Antennae different, tyloidea often larger 66

66. Ventral part of occipital carina unusually high. Intercarinal space broader than fore basitarsus. Antennal segments 6—12 with elongate tyloidea, oblong and widening towards apex on segments 6—9, broadly oval on segments 10—11, narrower on segment 12. Mesopleura somewhat shining, coarsely punctate, interstices smaller or slightly larger than punctures. Back of propodeum including enclosure closely reticulato-carinate. Petiole as long as tergite 1. Gastral tergite 2 and/or 3 or 2—4 red. Hind tarsi entirely yellowish-white. Stigma pale yellowish-brown, central part sometimes darkened. Arizona, California, Texas . . . . *pallidistigma* (Malloch) (p. 158)

— Occipital carina not unusually high. Stigma usually dark (cf. *basifuscus*). Intercarinal space narrower than fore basitarsus or antennal segments 6—12 not with elongate tyloidea 67

67. Tyloidea absent on segments 8—10 or much smaller than on preceding segments, elongate on segments 4—7, short and almost linear on segments 11—12. Upper half of mesopleura coarsely punctate, interstices about size of punctures. Hind margin of mesopleura and entire hypo-epimeral area coarsely rugose. Petiole about as long as tergite 1. Hind margins of tergites and bases of tergites 2—3 red. Hind tarsi brown 68

— Also antennal segments 8—10 with distinct tyloides 69

68. Tyloides on segment 8 small but distinct, on segments 9—10 very small, still distinct. Scutum shining, finely punctate. Texas . *texanus* (Malloch) (p. 170)

— Tyloides small or absent on segment 8, absent or very indistinct on segments 9—10. Scutum shining, somewhat more strongly punctate. Florida, Maryland, North Carolina, South Carolina . . . . *littoralis* (Malloch) (p. 171)

69. Tyloidea on segments 4—5 linear and short or indistinct, on segment 6 long oval, slightly raised, on segments 7—10 almost triangular, and angularly raised, highest point close to middle of each segment; tyloidea on segments 11—12 linear, less distinct, a short tyloides on segment 13. Intercarinal space narrow. Mesopleura slightly alutaceous, finely punctate, interstices on upper part larger, on lower part size of punctures or smaller. Petiole about 2/3 length of tergite 1, tergite 1 about 1.5 times as long as broad. Hind margin of tergite 1 and bases of tergites 2—3 more or less red. Hind basitarsi whitish, segments 2—4 yellowish-brown. Arizona, Iowa, New Mexico, Texas . . . . *angulicornis* (Malloch) (p. 157)

— Antennal segments 5—12 or 6—12 with distinct tyloides, less strongly, not angularly raised. Gaster black, more slender, tergite 1 longer 70

70. First tergite over twice as long as broad. Antennal segments 5—6 or 5—7 with narrow tyloides, shorter than segments, segments 7—12 or 8—12 with small oval tyloides, sometimes a small point on segment 13. Mesopleura dull, alutaceous, upper half anteriorly usually striato-punctate, below with distinct interstices between punctures. Petiole somewhat shorter than tergite 1. Hind tarsal segments 1—4 entirely whitish. Stigma dark brown. Arizona, Texas; Mexico; Guatemala . . . . *spangleri* sp.nov. (p. 162)

— First tergite about twice as long as broad 71

71. Antennal segments 5—6 with short narrow tyloides, sometimes absent on segment 5, segments 7—12 with broad oval tyloides, segment 13 with small or indistinct tyloides. Mesopleura slightly alutaceous, almost shining, strongly punctate, interstices mostly as large as punctures, no striae. Usually basal fourth of hind basitarsi brown or black, remainder of basitarsus and segments 2—4 whitish, or hind tarsus largely brown. Stigma usually whitish or pale brown. Arizona, California, Texas, New Mexico; Mexico . . . . *basifuscus* sp.nov. (p. 160)

— Antennal segments 6—8 or 7—8 with narrow tyloides or tyloidea distinctly raised in lateral view or gaster partly red 72

72. Gaster black. Antennal segments 7—8 with long narrow tyloides (short one on segment 6), tyloides on segment 9 widening towards apex, on segments 10—12 broad oval and shorter than segments; segments 8—12 in lateral aspect angularly raised on apical 1/3. Antennal segments 10—12 about quadrate. Mesopleura alutaceous, strongly, partly densely, punctate. Punctation of hypo-epimeral area with distinct interstices. Back of propodeum coarsely reticulato-carinate. Petiole about 2/3 length of tergite 1. Hind tarsal segments 1—4 whitish. Female unknown. Mexico . . . . *biformis* sp.nov. (p. 169)

— Hind margin of tergite 1 and all of tergites 2—3 reddish. Antennal segments 5—8 with linear tyloides (on segments 6—8 as long as segments in lateral view, in dorsal view shining part of tyloides not reaching base or apex of segment), tyloidea on segments 9—12 shorter. Antennal segments 11—12 distinctly longer than broad. Hypo-epimeral area dull, densely punctate, no distinct interstices. Mesopleura finely alutaceous, irregularly punctate, interstices mostly smaller than punctures. Back of propodeum finely reticulato-carinate. Petiole about 3/4 length of tergite 1. Hind tarsal segments 1—4 yellowish-brown, apices paler. Mexico: Baja California . *abbreviatus* sp. nov. (p. 182)

73. Antennae long and slender, segments 5—8 with long narrow tyloides, in lateral view distinctly raised in the middle. Hypo-epimeral area and mesopleura shining, indistinctly punctate. Scutum not depressed. Back of propodeum dull, dorsal half obliquely striate. Petiole nearly 1.5 times length of tergite 1. Black; pronotal tubercles and all tarsi brown. Ecuador; Peru; Surinam . . . . *trilobatus* sp. nov. (p. 218)

— More segments with narrow tyloides or all tyloidea indistinct or absent, or scutum with deep depressions and antennal segments 4—8 with tyloides 74

74. Metanotum in the middle with two small raised "wings", each with membraneous yellowish-transparent margin. Mesopleura alutaceous, punctate, interstices larger than punctures. Petiole longer than tergite 1. Antennal segments 6—11 with narrow tyloidea. Intercarinal space wider than fore basitarsus. Apical half of tergite 1 and greater part of tergite 2 red, or only hind margins of tergites reddish transparent. Argentina; Bolivia; Brazil; Paraguay . . . . *joergenseni* (Brèthes) (p. 235)

— Metanotum normal 75

75. Axillae projecting backward, laterally and posteriorly not touching scutellum. Back of propodeum coarsely reticulato-carinate. Petiole about as long as tergite 1. Intercarinal space narrow. Gaster black 76
— Axillae posteriorly normally touching scutellum 78
76. Median part of clypeal margin in frontal view bluntly protruding, distinctly raised, exposing labrum. Clypeal margin more shining than in *pygmaeus*. Vertex, scutum, scutellum and mesopleura smooth and shining, sparsely finely punctate. Antennal segments 6—12 with narrow linear tyloidea, segment 5 with indistinct tyloides. Hind tarsi largely brown. Colombia . . . . *facialis* sp. nov. (p. 234)
— Median part of clypeal margin more rounded or pointed, hardly raised . 77
77. Axillae in dorsal view slightly longer than broad, apex rounded, black. Scutum, at least anteriorly, slightly alutaceous, sparsely finely punctate. Upper half of mesopleura slightly alutaceous, distinctly punctate. Vertex behind ocelli very finely striate. Antennal segments 5—12 or 6—12 with narrow tyloidea, segment 13 with indistinct tyloides. Hind tarsi largely brown. Argentina; Bolivia; Peru . . . . *pygmaeus pygmaeus* (Brèthes) (p. 230)
— Axillae in dorsal view more elongate, brownish. Scutum smooth, with bluish shine, sparsely finely punctate. Upper half of mesopleura shining, not distinctly punctate. Vertex behind ocelli smooth. Antennal segments 6—13 with narrow tyloidea, tyloides rarely absent on segment 13. Hind tarsi yellowish-brown. Bolivia; Brazil; British Guyana; Colombia; Surinam . . . . *pygmaeus axillaris* subsp. nov. (p. 233)
78. Scutum, mesopleura and scutellum very coarsely rugose, no distinct punctures. Back of propodeum coarsely reticulate, enclosure shining, with large median area. Petiole about as long as tergite 1. Antennal segments 4—11 or 4—12 with long narrow tyloides. Intercarinal space narrow. Tergites 2—3, in specimens from the southern states also petiole and first tergite, more or less reddish. Tibiae reddish, rarely darkened. Hind tarsal segments 1—4 yellowish. Florida, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Virginia . . . . *rufibasis* (Malloch) (p. 186)
— Scutum much less coarsely rugose. Mesopleura smooth or more or less punctate 79
79. Mesopleura and hypo-epimeral area shining, smooth, mesopleura with fine or indistinct scattered punctures. Scutum shining, finely sparsely punctate. Back of propodeum coarsely reticulate, upper half with parallel oblique carinae, enclosure shining with large median area. Antennae long and slender. Gaster black, hind margins of tergites reddish transparent 80
— Mesopleura distinctly punctate or striato-punctate, if somewhat shining and very finely, very densely punctate (× 50) then also scutum densely punctate, or mesopleura shining and one or more tergites entirely red. Antennae not always long and slender 82
80. Tyloidea linear, distinct on segments 4—12, shorter on segments 11—12. Petiole as long as or somewhat longer than tergite 1. Pronotal tubercles brown. Fore and mid femora largely dark brown, tibiae yellowish-red, tarsi

yellowish, hind tarsi brownish. Argentina; Bolivia; Brazil; Colombia; Ecuador; Paraguay; Peru; Surinam; Venezuela . . . *nitens* sp. nov. (p. 210)

— Tyloidea indistinct. Petiole as long as or nearly as long as tergite 1. Pronotal tubercles whitish. Hind tarsi yellowish-white or brownish-yellow 81

81. Fore and mid femora and tibiae yellowish-red. Antennal segments 10—12 about 1.25 times as long as broad. Venezuela . . *araguensis* sp. nov. (p. 221)

— Fore and mid femora largely brown or black, fore and mid tibiae reddish-yellow. Antennal segments 10—12 at least about 1.5 times as long as broad. Peru . . . . *rufanalis* sp. nov. (p. 220)

82. Mesopleura densely distinctly punctate or ruguloso-punctate, interstices mostly narrower than punctures. If mesopleura partly striato-punctate and interstices on upper and/or lower part somewhat larger than punctures cf. *tibialis* and *albifacies*; if punctation moderately dense and hind tarsi orange-brown or yellowish-brown cf. *punctatellus*. Tyloidea always distinct, at least on segments 5—10 83

— Interstices on mesopleura mostly as large as or much larger than punctures, or punctures close but fine and very superficial (*townsendi*), or punctation indistinct (*marthae* and *metaensis*). Tyloidea sometimes indistinct, or only segments 4—8 with tyloides or tyloidea entirely absent 96

83. At least tergite 2 entirely red. Antennal segments 4—11 with distinct tyloides. Scutum shining, strongly punctate. Mesopleura and hypo-epimeral area densely finely punctate and striato-punctate. Back of propodeum coarsely reticulate, enclosure with large median area. Petiole about as long as tergite 1 84

— Gaster black, hind margins of tergites, rarely also bases of segments 2—3 reddish or transparent or scutum densely punctate. If hind margin of tergite 2 and all of tergite 3 red, then back of propodeum finely rugulose (*rugulosus*, No. 91) 85

84. Hind margin of tergite 1 and all of tergite 2 red. Mesopleura and hypo-epimeral area dull (Brazil) or shining (Argentina, Surinam). Face silvery. Argentina; Bolivia; Brazil; Surinam . . . . . *medius medius* (Smith) (p. 200)

— Tergite 1 except for two large black marks, all of tergite 2 and all or nearly all of tergite 3 red. Face pale golden. Curaçao; Venezuela . . . . *medius zuliensis* subsp. nov. (p. 202)

85. Petiole longer than tergite 1. Mesopleura densely punctate, partly striato-punctate. Hypo-epimeral area shining, punctate, interstices about size of punctures. Scutum shining, densely punctate, partly transversely or oblique rugose. Antennae slender, segments 4—13 with linear tyloides, as long as segments, short on segment 13. Hind tarsi brown or reddish-brown. Pubescence of face pale golden, not appressed. Ecuador . . . . *fritzi* sp. nov. (p. 199)

— Petiole at most as long as tergite 1 86

86. Antennal segments 7—13 with tyloides, segments 10—12 longer than broad. Scutum shining, distinctly, relatively finely punctate, interstices mostly wider than punctures. Mesopleura more or less shining, upper half rugoso-punctate,

lower part punctate with narrow interstices. Petiole about 3/4 length of tergite 1. Hind tarsi brown. Puerto Rico; Dominican Republic; Haïti; Leeward Islands; Virgin Islands . . . . *atricornis* (Malloch) (p. 194)

— Antennal segments 4—5, 5—6 or 6 too with distinct linear tyloides 87

87. Antennal segments 5—10 or 6—10 with distinct linear tyloides 88

— Also segments 11, 12 or 13 with tyloides 89

88. Antennal segments 5—10 with black tyloides, sometimes also a short tyloides on segments 4 and 11. Intercarinal space narroa. Mesopleura dull, closely coarsely punctate, interstices on upper or lower part partly larger t an punctures. Petiole about 3/4 of length of tergite 1. Hind tarsal segments 1—4 whitish. District of Columbia, Florida, Louisiana, Missouri, South Carolina, Tennessee, Texas, Virginia . . . . *tibialis* (Cresson) (p. 188)

— Antennae more slender, segments 5—10 or 6—10 with brown or black tyloides. Intercarinal space nearly as broad as fore basitarsus. Mesopleura much finer densely punctate, not distinctly striato-punctate. Petiole almost as long as tergite 1. Bases of hind tarsal segments 2—4 pale brown. Argentina; Bolivia; Brazil . . . . *stramineipes* sp. nov. (p. 204)

89. Antennal segments 5—12 with tyloides, small on segment 12; segments 11—12 little longer than broad or almost quadrate. Mesopleura and hypo-epimeral area densely ruguloso-punctate. Scutum shining, moderately densely punctate, posteriorly mostly striato-punctate. Petiole slightly over half length of tergite 1. Hind tarsi brown. Cuba; Jamaica; Mexico; Nicaragua . . . . *argentifrons* (Cresson) (p. 192)

— Antennal segments 4—11, 4—12 or 4—13 with tyloides. Mesopleura often partly with distinct interstices or antennal segments at least 1.5 times as long as broad or hind tarsi whitish. Petiole longer 90

90. All tarsi brown or dark brown. Petiole about 3/4 length of tergite 1. Mesopleura and hypo-epimeral area densely punctate and striato-punctate. Antennal segments 3—12 or 4—12 with distinct tyloides, segment 13 sometimes with a small one 91

— Hind tarsi whitish; if yellowish-brown or orange-brown then petiole as long as tergite 1 and segments 4—11 with distinct tyloides 92

91. Pronotal tubercles and gaster black. Underside of flagellum dark brown, last segment reddish-brown. Antennal segments 4—12 with linear tyloides, distinctly raised; segments below regularly convex (lateral aspect). Mesopleura and hypo-epimeral area dull. Scutum dull, punctate, interstices smaller than punctures. Back of propodeum coarsely reticulato-carinate. Female unknown. New Mexico, Texas . . . . . *castaneipes* sp. nov. (p. 197)

— Pronotal tubercles white. Tergite 3 red. Underside of flagellum orange-brown. Antennal segments 3—12 or 4—12 with fine linear tyloides, not distinctly raised. Mesopleura somewhat shining. Scutum very shining, coarsely punctate, partly rugoso-punctate. Back of propodeum very finely rugulose. Female unknown. Texas . . . . *rugulosus* sp. nov. (p. 197)

92. Antennae slender; tyloidea on segments 4—11 distinct, on segment 12 indistinct. Hind tarsi orange-brown, bases of segments more or less darkened.

Petiole about as long as tergite 1. Mesopleura alutaceous or shining, moderately densely finely punctate, interstices size of punctures, partly larger. Hypo-epimeral area faintly shining, finely punctate, interstices distinct. Back of propodeum coarsely reticulate. Pronotal tubercles brown or yellowish. Costa Rica; El Salvador; Guatemala; Mexico . . . . *punctatellus* sp. nov. (p. 179)

— Antennal segments 4—12 or 4—13 with distinct tyloides. Hind tarsal segments 1—4 yellowish-white 93

93. Petiole about as long as tergite 1. Antennal segments 4—12 with tyloides. Pronotal tubercles whitish 94

— Petiole 1/2 to 3/4 length of tergite 1. Antennal segments 4—12 or 4—13 with tyloides. Pronotal tubercles brown or whitish 95

94. Back of propodeum moderately finely reticulate. Punctation of mesopleura fine, interstices on upper part larger than punctures, on lower part smaller. Scutum dull, densely not coarsely punctate, punctures partly in rows. Antennal segments 4—12 with black tyloides, short on segment 12. Iowa, Texas . . . . *albifacies* (Malloch) (p. 187)

— Back of propodeum very coarsely reticulate, enclosure with large shining median area. Mesopleura and hypo-epimeral area dull, upper half or median part of mesopleura moderately coarsely striato-punctate, interstices on lower part may be partly wider than punctures. Scutum strongly punctate, with faint transverse rugae. Hind tarsal segments 2—4 basally somewhat infuscated. Texas, North Carolina; Mexico; Belize . . . . *aerofacies* (Malloch) (p. 183)

95. Pronotal tubercles black or brown. Petiole about 1/2 to 2/3 length of tergite 1. Antennal segments 4—13 with tyloides, on segments 7—12 shorter than segment, on segment 13 very short; segments 7—10 in lateral aspect raised near the middle. Mesopleura dull, closely punctate. Upper half of back of propodeum finely, mostly parallel, carinate. Intercarinal space narrow. Mexico . . . . *alphitopus* sp. nov. (p. 195)

— Pronotal tubercles whitish. Petiole about 3/4 length of tergite 1. Antennal segments 4—12 with tyloides. Mesopleura with large, mostly contiguous punctures, interstices, if any, lineolate, on upper part sometimes as large as punctures. Occipital and hypostomal carinae almost contiguous. Back of propodeum more coarsely reticulato-carinate. Florida, Georgia, North Carolina . . . . *arenivagus* Krombein (p. 190)

96. Hypo-epimeral area distinctly punctate. Propodeal enclosure irregularly carinate. Back of propodeum finely reticulato-carinate. Pronotal tubercles whitish. Hind tarsi largely brown 97

— Hypo-epimeral area almost smooth and shining, punctures indistinct. Propodeal enclosure sometimes with large shining median area 98

97. Antennal segments 5—12 with linear tyloides, short on segment 12. Hypo-epimeral area dull, finely but distinctly punctate. Mesopleura finely alutaceous, somewhat shining, distinctly punctate, interstices wide on upper part (in Arizona specimens punctures on mesopleura coarser, interstices about size of punctures or slightly larger and mesopleura and hypo-epimeral

area shining). Gaster black or tergites 2—3 entirely or partly red. Alabama, Arizona, California, District of Columbia, Florida, Iowa, Kansas, Louisiana, Missouri, New Mexico, North Carolina, South Carolina, Tennessee; Cuba; El Salvador; Mexico; Nicaragua . . . . *sayi* (Rohwer) (p. 173)

— Antennal segments 4—8 with long linear tyloides. Hypo-epimeral area and mesopleura shining, hypo-epimeral area finely punctate, mesopleura with strong punctures, interstices about size of punctures. Scutum strongly punctate, with longitudinal median depression and a triangular depression in front of scutellar suture. Gaster black. Female unknown. Mexico . . . . *depressus* sp. nov. (p. 181)

98. Antennae without tyloidea, segments 10—12 about 1.5 times as long as broad. Mesopleura shining, finely punctate, interstices about four times size of punctures. Hypo-epimeral area shining with a few minute hair-bearing punctures. Back of propodeum coarsely reticulate. Petiole about as long as tergite 1. Posterior half of tergite 1, all of tergite 2 red. Pronotal tubercles whitish. Hind tarsal segments brown with paler apices. Female unknown. Venezuela . . . . *incarinatus* sp. nov. (p. 222)

— Antennae with fine, sometimes indistinct, linear tyloides. Mesopleura somewhat dull, rarely shining, punctures indistinct or gaster black 99

99. Petiole shorter than tergite 1. Hind tarsi whitish or yellowish-white, at least segments 1—2, or bases of segments dorsally brown. Scutum shining, finely punctate 100

— Petiole somewhat longer than tergite 1. Hind tarsi brown. Scutum shining, strongly punctate. Back of propodeum, also laterally, coarsely reticulato-carinate. Mesopleura somewhat dull, no distinct punctures 101

100. Antennal segments 3—12 about twice as long as broad, segments 4—9 or 4—10 with fine linear tyloides, segment 13 also ventrally dark. Back of propodeum dull, more closely reticulate, dorso-lateral carinae indistinct, enclosure finely coriaceous. Mesopleura densely superficially punctate. Gaster blackish-brown, hind margins of tergites reddish, often also base of tergite 3. Hind tarsi yellowish or bases of segments dorsally brown. Ecuador; Peru . . . . *townsendi* (Cockerell) (p. 207)

— Antennal segments 3—12 about 1.5 times as long as broad, segments 6—11 with very narrow pale tyloides, underside of flagellum orange-yellow. Back of propodeum coarsely reticulato-carinate, with large shining median area. Mesopleura more distinctly alutaceous, sparsely finely punctate. Gaster black. Hind tarsal segments 3—5 pale brown. Mexico . . . . *evansi* sp. nov. (p. 184)

101. Tergites 2—3 and at least sternites 2—3 reddish with more or less distinct brown band before apical margin of tergites, remaining tergites with transparent reddish hind margin. Antennal segments 4—10 or 4—11 with indistinct, not shining, linear tyloides. Scutum, at least on anterior part, weakly rugoso-punctate. Vertex behind ocelli dull, finely transversely striate. Bolivia; Brazil; Colombia; Ecuador; Peru . . . . . *marthae* sp. nov. (p. 208)

— Gaster black, segments with narrow reddish hind margins. Antennal segments

4—11 with distinct, shining, fine linear tyloides. Scutum more shining, punctures separate. Vertex behind ocelli smooth and shining. Colombia . . . . *metanus* sp. nov. (p. 210)

Group of *longiventris*

Pluto longiventris (Malloch)
(figs. 1—2)

Malloch, 1933: 52, ♀ and ♂ (*Psenia longiventris*; Arizona, California).
Krombein, 1951: 962 (*Pluto longiventris*, comb. nov.).
Bohart & Menke, 1976: 171.

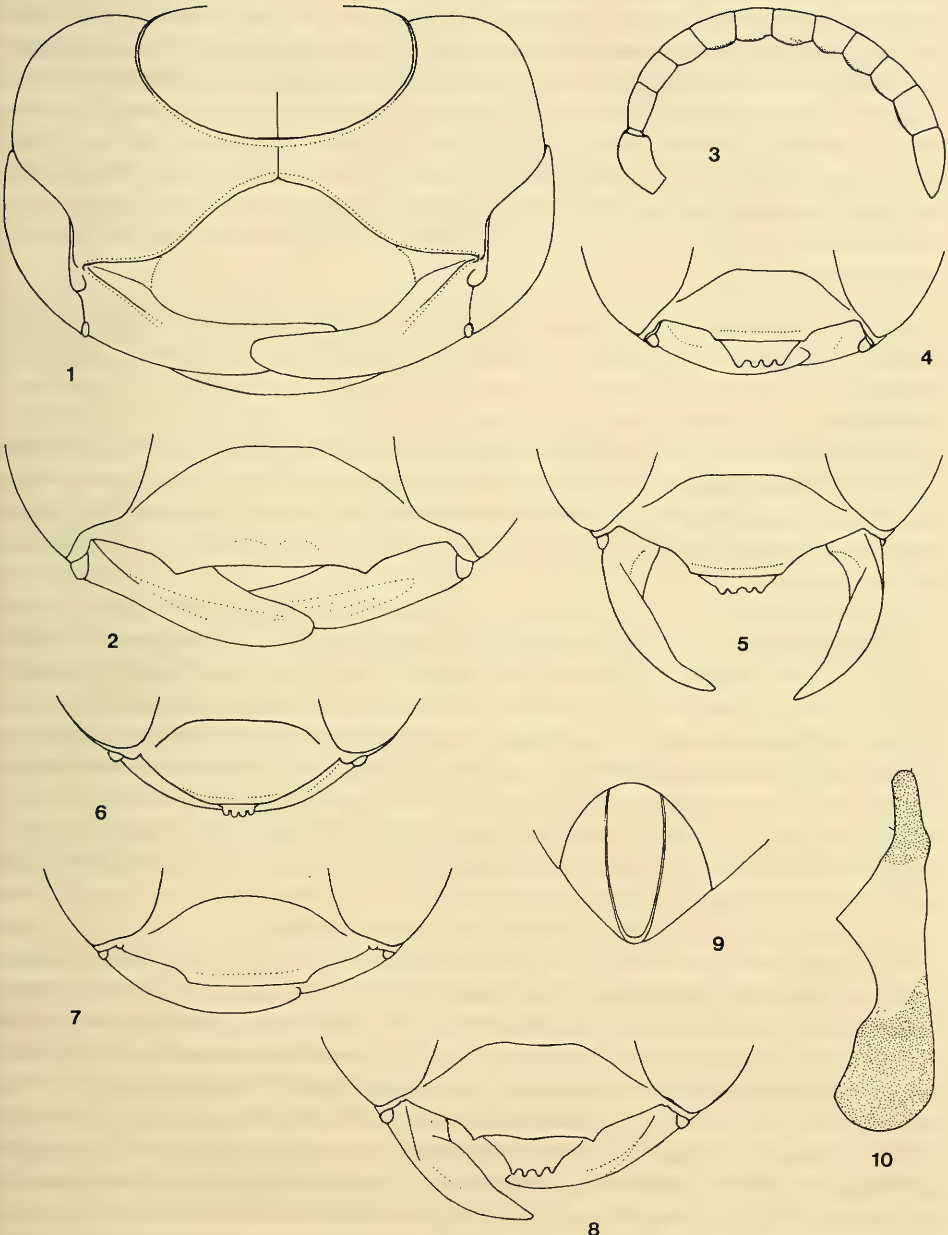
Female. — Length about 9 — 9.5 mm. Black. Apical 2/3 of mandibles yellowish-red with darker tips. Underside of flagellum pale yellowish-white, base of third antennal segment and underside of apical three segments more or less darkened. Pronotal tubercles and tegulae yellowish-white. Veins of wings brown, stigma paler. Foreside of fore tibiae with incomplete yellowish-white streak; base of mid and hind tibiae and all tarsi except apex of last segment of hind tarsi yellowish-white. Apical margins of tergites 1—5 and of sternites reddish transparent.

Clypeus dull, median part of margin almost straight with small lateral teeth (fig. 2), before apical margin somewhat raised and shining. Distance between clypeal teeth about half total width of margin. Frons before median ocellus densely punctate, upper part of frons and vertex almost impunctate. Intercarinal space about as wide as fore basitarsus (fig. 1). Third antennal segment over 2.5 times as long as broad, segments 8—11 about quadrate, segment 12 over 1.5 times as long as broad.

Pronotal angles in frontal view with short lobe, in dorsal view with sharp angle. Scutum shining, punctures distinct, somewhat sparse, near fore and hind margins more closely placed. Prescutal sutures continued to hind margin as a row of punctures. Scutellum shining, sparsely finely punctate. Metanotum dull. Enclosed area of propodeum shining, with large median area. Back of propodeum dull, reticulato-carinate, carinae laterally behind enclosed area more parellel; longitudinal groove narrow. Anterior oblique suture broad, coarsely foveolate. Hypo-epimeral area coarsely longitudinally rugoso-punctate. Upper part of mesopleura with long longitudinal rugae, posterior margin finely striate, lower part reticulate alutaceous and with rather large sparse punctures. Gaster shining, densely finely punctate. Petiole about half as long as first tergite. Pygidial area at least twice as long as broad, elliptic, apex rounded. Second recurrent vein of fore wings ending in third submarginal cell.

Pubescence of face silvery, of pygidial area brown and appressed, entire last segment also with long erect brown hairs, pubescence of rest of body whitish. Apical margins of sternites 2—5 with a few long erect pale hairs.

Male. — Length about 7—9 mm. Resembling female. Underside of flagellum and all of last segment orange-brown. Clypeal margin rounded, medially with two



Figs. 1—2. *Pluto longiventris* (Malloch), ♀; 1, head in ventral aspect; 2, clypeus. Figs. 3—4. *P. angulicornis* (Malloch); 3, antenna of ♂; 4, clypeus of ♀. Figs. 5—8. Clypeus; 5, of *P. pallidistigma* (Malloch), ♀, allotype; 6, *P. rotundus* sp. n., ♀, holotype; 7, *P. suffusus* (Fox), ♀; 8, *P. texanus* (Malloch), ♀, paratype. Fig. 9. *P. brevipetiolatus* (Rohwer), ♀, pygidial area. Fig. 10. *P. littoralis* (Malloch), ♂, Cedar Key, left paramere, dorsal aspect.

indistinct teeth. Antennal segments 4—11 about 1.5 times as long as broad, segment 12 somewhat shorter, segment 13 about twice as long as broad. Segments 6—12 with oval tyloidea, gradually increasing in size, on segment 12 about half as long as segment; segments in lateral view angular. Segment 13 with short tyloides.

Lateral pronotal angles less sharp, in dorsal view about rectangular. Scutum shining, coarsely punctate with short transverse rugae. Scutellum shining, a few coarse punctures. Back of propodeum coarsely reticulato-carinate. Mesopleura and hypo-epimeral area entirely coarsely rugose, mesosternum with fine separate punctures. Gaster slender, petiole about as long as first tergite, this tergite over twice as long as broad.

Material examined: 1 ♀, allotype, Gilbert, Arizona, 29 ♂, paratypes, Higley and Mount Superstition, Arizona; Lindsay, El Centro and Holtville, California (USNM, type Nr. 44222); also 2 ♂ from Higley and 1 ♀ from Holtville without type labels.

New records from USA: Arizona: 1 ♂, Atascosa Mts., Santa Cruz Co., 30 June 1953, R. S. Beal (CIS); 1 ♂, 10 mi southwest Patagonia, Santa Cruz Co., 13 Sept. 1958, M. A. Cazier (CIS); 1 ♂, Tucson, 18 June 1938, R. H. Crandell (KVK); 1 ♂, Yuma, 16 July 1953, on cotton, coll. Hago (USNM); 1 ♀, Portal, 17 Aug. 1974, H. and M. Townes (HT).

California: Butte Co.: 1 ♂, Chico, 13 July 1965, T. R. Haig (CSC); Glenn Co.: 2 ♂, Willows, 16 June 1970, D. Schult (CSC); Imperial Co.: 1 ♂, Calipatria, 14 Aug. 1916, F. A. McGregor; 1 ♀, Holtville, 25 Sept. 1916, F. A. McGregor; 5 ♀, 4—6 June 1912, 1 ♂, June 1911, 2 ♂, 29 May 1912, Experiment Farm, of which 1 ♀ and 1 ♂ on *Helianthus annuus*, "Vtg. gland. hairs of lvs" (visiting glandular hairs of leaves), J. C. Bridwell (USNM); 1 ♂, Bard, 17 Aug. 1965, ex *Gossypium hirsutum*, H. Ray, *Pluto longiventris* Malloch det. R. M. Bohart (CSC); Riverside Co.: 1 ♂, Romaland, 17 Aug. 1946, J. W. MacSwain (USNM); San Mateo Co.: 1 ♀, Palo Alto, F. Grinnell Jr. (USNM); Stanislaus Co.: 1 ♀, 10 mi southwest Turlock, 25 Aug. 1956, R. R. Snelling (CSC); Tulare Co.: 1 ♂, 24 May 1947, 5 ♂, 14—30 June 1947, Wood L., in Rotary trap, Norman W. Frazier (USNM).

First records from Mexico: Baja California: 1 ♂, Sierra de Juárez, Santa Catarina foothills, 43 mi east Ensenada, 3600 ft, 18 Aug. 1962, on *Adolphia californica*, D. E. Breedlove (CAS). Guerrero: 2 ♀, Zumpango, 22 July 1963, F. D. Parker and L. A. Stange (UCD). Jalisco: 1 ♀, 3 mi north Barra de Navidad, 100 ft above Hotel Melanane, 14 Febr. 1966, D. Bolinger (OSU). Michoacan: 3 ♂, 11 mi east Apatzingán, 20 Aug. 1954, E. G. Linsley, J. W. McSwain and R. F. Smith (UCD). Oaxaca: 1 ♀ and 1 ♂, Tehuantepec, 15—16 July 1964, Paul J. Spangler (USNM). Puebla: 8 ♂, 3 mi north Petlalcingo, 21 Aug. 1963, F. D. Parker and L. A. Stange (UCD). Sinaloa: Mazatlán, 10 ft, 1 ♀, 19 July 1959, H. E. Evans (CU), 1 ♂, 10 May 1961, at light, Howden and Martin (CNC); 1 ♂, 5 mi north Mazatlán, 15 Aug. 1970, Malaise trap 10A-2P, M. Wasbauer and J. Chemsak (CIS). Sonora: 1 ♂, 5 mi south Magdalena, 25 May 1962, F. D. Parker and L. A. Stange, 2 ♀, 5 mi east Navojoa, 9 Sept. 1970, R. M. Bohart (UCD).

The female of *P. longiventris* is easily recognized by the sharp angles of the

pronotum and the rugae on the mesopleura, the male by the coarsely rugose mesopleura and the oval tyloidea.

The males from Mexico often have a more coarsely sculptured scutellum, sometimes this is rugoso-punctate.

Group of *angulicornis*

Pluto angulicornis (Malloch)
(figs. 3—4)

Malloch, 1933: 58, ♀ and ♂ (*Psenia angulicornis*; Texas).
Krombein, 1951: 962 (*Pluto angulicornis*, comb. nov.).
Bohart & Menke, 1976: 171.

Female. — Length about 5 mm. Head and thorax black; mandibles and labrum reddish. Underside of flagellum yellowish-red. Pronotal tubercles yellowish-white, tegulae entirely reddish or partly yellowish-white. Fore tibiae and tarsi largely reddish, tibiae with yellowish-white streak on outer side, first tarsal segments yellowish-white. Mid tibiae reddish-brown with yellowish base and yellowish-white streak on outer side, tarsal segments 1—3 yellowish-white, segments 4—5 brown. Basal third of hind tibiae and tarsal segments 1—4 yellowish-white, last segment brown. Gaster largely black, hind margin of tergite 1, all of tergites 2—3 and sternites 2—4 red, or tergite 3 and sternites 3—4 largely brown.

Protruding median part of clypeal margin about 1/3 of total width of margin, this part almost straight, lateral angles obtuse, no distinct teeth (fig. 4). Frons except for lateral parts densely punctate. Vertex more or less shining, finely reticulate alutaceous, distinctly punctate, interstices larger than punctures. POD about 1.5 times as long as OOD. Occipital carina fine but complete, also on ventral side of head (Malloch: "evanescent as it approaches central line of ventral surface"). Intercarinal space narrow. Antennae clavate segments 9—11 much shorter than long.

Lateral pronotal angles about rectangular. Scutum and scutellum shining, finely punctate, interstices as large as or a few times size of punctures. Median part of propodeal enclosure irregularly reticulate, back of propodeum rather finely reticulato-carinate, dorso-lateral parts finely striate. Hypo-epimeral area somewhat glossy, very finely but distinctly punctate, interstices about size of punctures or larger. Mesopleura finely reticulate alutaceous, finely punctate, interstices mostly not larger than punctures, interstices larger on upper part; posterior part of mesopleura and of hypo-epimeral area finely coriaceous. Petiole about half as long as first tergite, this tergite about as long as broad. Pygidial area at most 2.5 times as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Face silvery, mostly appressed, pubescent, pygidial area with golden-brown pubescence and also with long erect hairs, rest of body whitish to greyish pubescent.

Male. — Resembling female. Hind margin of first tergite and bases of tergites

2—3 more or less red. Antennal segments 7—10 with dark and rather broad tyloides, shorter than segments and almost angularly raised in the middle of the segments (fig. 3); segments 4—5 with small linear tyloides which may be very indistinct, segment 6 with long oval low tyloides, segments 11—12 with linear, indistinct tyloides, a short one on segment 13. Petiole about 2/3 length of first tergite, this tergite about 1.5 times as long as broad.

Material examined: Texas, 1 ♀, allotype and 1 ♀, paratype, Plano, July 1907, one in oatfield and one in wheatfield, E. S. Tucker, 1 ♀, paratype, Plano, August 1907, E. S. Tucker, 1 ♂, paratype, Brownsville, J. C. Bridwell (USNM, type No. 44229). The paratype from Neuecest, Texas, 28 April 1896, coll. Marlatt, erroneously recorded by Malloch as a male, is a female and different from the allotype. The punctation of the mesopleura is wider, the hypo-epimeral area is more coarsely punctate, the scutum is distinctly alutaceous and the base of the hind basitarsus is brown. Most likely it is a rather small specimen of *P. basifuscus*.

New records from USA: Texas: 1 ♀, 16 May 1945, Laredo, inside airport building, with label "*Pluto angulicornis* Mall., det. Tow". Iowa: 2 ♂, 25 Aug. 1935, H. E. Jaques (CNC). Louisiana: 1 ♀ and 1 ♂, Tallulah, 25 June 1948, Bug Catcher Exp., R. C. Gaines (USNM). New Mexico: 1 ♂, 5.4 mi northeast Santa Rosa, 10 July 1929, on *Salsola pestifer*, V. E. Romney (USNM).

The female of *P. angulicornis* is very similar to that of *P. basifuscus*, but its scutum and scutellum are shining and the punctation of the mesopleura is much finer. The tyloidea of the males of the two species are distinctly different.

Pluto pallidistigma (Malloch)
(fig. 5)

Malloch, 1933: 52—53, ♀ and ♂ (*Psenia pallidistigma*; Arizona, Texas).
Krombein, 1951: 962 (*Pluto pallidistigma*, comb. nov.).
Bohart & Menke, 1976: 171.

Male. — Length about 6—7 mm. Head and thorax black. Labrum and mandibles yellowish-red. Antennae brown, underside of flagellum yellowish-red. Pronotal tubercles, tegulae and stigma of wings whitish, stigma sometimes yellowish-brown or central part brownish. Veins of wings pale brown, at base whitish, wings hyaline. Fore and mid tibiae reddish-brown, outer side of tibiae and all of tarsi yellowish-white. Basal 2/5 of hind tibiae and tarsal segments 1—5 whitish, last segment slightly darkened. Hind margin of first gastral tergite, all of tergites 2—3 or 2—4 red, sometimes tergite 2 largely darkened. Ventral plate of petiole, sternites 2—4 and apex of last segment reddish, often most of sternites darkened.

Median part of clypeus slightly protruding. Frons densely punctate, vertex more sparsely so, more or less micro-sculptured, back of head somewhat transversely striate. Lower part of occipital carina unusually high, directed obliquely backward. Intercarinal space broader than first basitarsus. Antennae long and slender, last segment 2.5 times as long as broad, segments 6—12 with distinct tyloides,

much shorter than segments, on segments 6—9 oblong, somewhat widening towards apex, more broad oval on segments 10—11, narrower on segment 12.

Lateral pronotal angles about rectangular. Scutum and scutellum shining, strongly punctate, interstices mostly a few times size of punctures. Propodeum including enclosed area densely irregularly reticulato-carinate. Mesopleura shining, coarsely strongly punctate, interstices partly smaller than punctures, partly somewhat larger, hind margin coriaceous. Hypo-epimeral area shining, punctures finer and closer, a few large interstices. Anterior plate of mesepisternum shining, densely coarsely punctate, oblique carina crenulate. Gaster slender, petiole as long as first tergite, this tergite about twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Pubescence of head and thorax silvery, on face dense and mostly appressed, gaster greyish-white pubescent.

Female (as associated with preceding male by Malloch). — Colour as in male. Hind margin of first tergite, all of tergites 2—3 and sternites 2—3 red. All tarsi entirely whitish, except for extreme base of hind basitarsus.

Median part of clypeal margin slightly rounded, almost straight (fig. 5), less than 1/3 of total width of margin. Lower part of occipital carina not unusually high, intercarinal space narrower than first basitarsus. Antennae short, gradually widening towards apex, segments 9—11 over 1.5 times as broad as long. Scutum and scutellum somewhat shining, very finely reticulate alutaceous, sparsely punctate. Propodeal enclosure somewhat shining, irregularly reticulate, back dull, very finely and closely reticulato-carinate, dorsolaterally with oblique parallel carinae. Mesopleura distinctly reticulate alutaceous, finely punctate, interstices a few times size of punctures, hind margin coriaceous. Hypo-epimeral area dull, densely distinctly punctate. Anterior plate of mesepisternum dull, finely punctate, on lower part finely vertically striate. Petiole about half as long as first tergite, this tergite longer than broad. Pygidial area about 2.5 times as long as broad, densely golden-brown pubescent.

Material examined: 1 ♂, holotype, Arizona, Mt. Superstition near Higley, 24 July 1917, E. G. Holt, labelled "*Psenia pallidistigma* type det. J. R. Malloch"; 1 ♀, allotype, Texas, Cotulla, 11 May 1906, J. C. Crawford (USNM, type No. 44223).

New record from Arizona: 1 ♀, Portal, 23-31 July 1959, on flowers of *Acacia*, K. V. Krombein (KVK).

New records from Texas: 1 ♂, Big Bend National Park, Nine Point Draw, 3000 ft, 20 May 1959, 2 ♂, Fort Davis, Point Rocks, 5000 ft, 29—30 May 1959, W. R. M. Mason (CNC).

First records from California: Imperial Co.: 1 ♂, Experiment Farm, 21 May 1912, v(isi)t(in)g gland(ular) hairs of l(ea)v(e)s *Helianthus annuus*, J. C. Bridwell (USNM); Inyo Co.: 2 ♂, Ballarat, Panamint Valley, 10 June 1961, H. F. Howden (CNC); San Bernardino Co.: 1 ♂, 9 air mi south Baker Zzyzx Sprs., 20—21 April 1977, M. Buegler (CIS).

There is no proof, as yet, that the male and the female recorded from different states were correctly associated by Malloch, although a similar female has now

also been recorded from Arizona. The differences between the sexes are considerable. I could not find any structural differences between the female studied by Malloch and the females from Texas identified by me as *basifuscus* sp. nov.; the latter were collected with some male specimens of *basifuscus*. The only distinguishing character of the females seems to be the white colour of the hind tarsi, including the last segment, of *pallidistigma*. This is not a very reliable character, however, and possibly the true female of *P. pallidistigma* has not yet been recognized. The males of *P. pallidistigma* and *P. basifuscus* are easily separated.

Pluto basifuscus sp. nov.

Male. — Length about 6 mm. Black. Mandibles and labrum dark reddish. Underside of flagellum brown, last segment reddish-brown. Pronotal tubercles and tegulae whitish. Foreside of fore femora and of fore tibiae yellowish-brown, tibiae with yellow outer streak, tarsi whitish, last segment brown. Mid tibiae brown, base and tarsal segments 1—4 whitish. Hind tibiae with narrow whitish basal ring, tarsal segments 1—4 whitish, basal 1/4 or 1/3 of basitarsus brown. Veins of wings brown, stigma sometimes paler. Hind margins of tergites more or less reddish.

Median part of clypeal margin slightly rounded. Frons strongly punctate, somewhat raised in front of posterior ocelli. Vertex shining or finely alutaceous, sparsely punctate. POD much larger than OOD. Underside of head finely striate. Ventral part of occipital carina of normal height, intercarinal space narrow. Antennae slender, segments longer than broad; segments 5—6 with short narrow tyloides, segments 7—12 with broad oval tyloides, about 1/3 of length of segment, a smaller or indistinct tyloides on segment 13.

Lateral pronotal angles obtuse. Scutum shining, densely punctate, interstices mostly larger than punctures. Scutellum shining, sparsely finely punctate. Propodeal enclosure and back of propodeum irregularly finely reticulato-carinate. Mesopleura reticulate alutaceous, almost shining, coarsely punctate, interstices mostly about size of punctures, on upper part somewhat larger with also some micropunctation. Hypo-epimeral area dull, densely punctate. Anterior plate of mesepisternum striato-punctate. Gaster slender, petiole almost as long as first tergite, this tergite about twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Pubescence of face silvery, mostly appressed, of rest of body whitish. Wings whitish pubescent.

Female. — Normally basal 1/3 of hind basitarsus and greater part of tarsal segment 5 brown. For further description cf. *P. pallidistigma* (Malloch).

U.S.A.: Texas: 10 mi west Fort Davis, Pt. Rocks, 5000 ft, 1 ♂, holotype and 1 ♀, allotype, 30 May 1959. Paratypes: 3 ♂ and 6 ♀, 29—30 May 1959; Fort Davis, Limpia Cn., 5000 ft, 1 ♀, 28 May 1959, W. R. M. Mason (CNC); San Diego, 1 ♀, 24 May, Ashmead (USNM); Uvalde Co., 1 ♂, Speir Rch. 3 mi northwest Uvalde, 1 May 1977, Malaise trap 10A—5P and 1 ♂, Nueces Riv. 12 mi south Uvalde, 30 April 1977, Malaise trap 12M-4P, T. Eichlin and M. Wasbauer (CSC). Arizona:

2 ♂, Douglass, July 1940, D. G. Hale; 1 ♀, Cochise Co., San Bernardino Rch., 10—11 June 1968, Menke and Flint (USNM); 2 ♀ and 8 ♂, Portal, 10—25 Aug. 1974, 2 ♂, Parker Canyon Lk., 22—23 Aug. 1974, 1 ♀ and 1 ♂, McNeal, 24 Aug. 1974, all H. and M. Townes (HT). New Mexico: 3 ♀, Hatch, 28—30 Aug. 1974, H. and M. Townes (HT). California: 1 ♂, La Mesa, 8908 Lemon Avenue, 9 Aug. 1958, F. X. Williams (CAS).

Mexico: 1 ♂, 17 mi north Fresnillo, Zacatecas, 16 July 1954, J. W. McSwain. Chihuahua: 1 ♂, 10 mi north Jiménez, 21 Sept. 1970, R. M. Bohart. Oaxaca: 1 ♂, coll. Crawford (UCD); this male has finer punctate mesopleura. Sinaloa: 1 ♂, Mazatlán, 15—20 Aug. 1962, H. E. Evans (MCZ). Baja California: 1 ♀, San Pedro, 7 Oct. 1941, Ross and Bohart; 1 ♂, Big Canyon, Sierra Laguna, 13 Oct. 1941, Ross and Bohart (CAS). All paratypes.

P. basifuscus is apparently a variable species. A female and a male from Texas have a broad intercarinal space. In further respects they are identical with the rest of the material and it does not seem likely that they belong to different species.

The gaster of the female from San Diego is darker, tergites 2—3 having a black mark which covers the greater part of the disk. In three of the females and in one of the males from the type-locality, as well as in the two females from Portal, Arizona, also the hind tarsal segments 2—4 are more or less brown, the basitarsus for the greater part so. In the two males from Arizona the underside of the flagellum is orange-brown.

Because of the similarities between the *basifuscus* females with pale hind tarsi and the single female from Texas, which Malloch associated with the male type of *pallidistigma* from Arizona, further studies are much needed. That in Texas males of *pallidistigma* were collected on the same spot and on the same date as *basifuscus*, the latter species being represented by females as well as males, makes matters even more confusing. Series of both sexes of *pallidistigma*, collected flying together at the type-locality in Arizona, might enable us to solve this problem.

The male of *P. basifuscus* much resembles the male of *P. spangleri*, which has smaller tyloides and a more slender gaster. Confusion of the male of *P. basifuscus* with *P. pallidistigma* is hardly possible as the former has no high occipital carina like *P. pallidistigma*. The specific name *basifuscus* refers to the dark base of the hind basitarsi of both female and male.

Aberrant form.

A male from Mexico, Baja California, Aqua Caliente (San Carlos), 18.5 km east of Maneadero, 6 July 1973, P. H. Arnaud (CAS) is extremely dark. The mid tibiae have no white on their outer side; all tarsi are brown, hind tarsi dark brown with paler tips. The tyloidea on antennal segments 5—6 are broader towards the apex of the segments; tyloides on segment 7 long oval, all almost as long as segments, tyloidea on segments 8—12 broad oval, about half length of segment. The mesopleura are more finely punctate than in the other males; hypo-epimeral area finely but distinctly punctate, interstices about size of punctures.

Although provisionally considered an aberrant form of *P. basifuscus*, this specimen may represent a distinct species.

Pluto minutus (Malloch)

Malloch, 1933: 59, ♀ (*Psenia minuta*; Texas).
Krombein, 1951: 962, ♀ (*Pluto minutus*, comb. nov.).
Bohart & Menke, 1976: 171.

Female. — Length 5 mm. Head and thorax black; anterior margin of clypeus dark reddish, mandibles and labrum yellowish-red, underside of flagellum orange-brown. Pronotal tubercles and tegulae yellowish-white. Fore tibiae and tarsi yellowish, underside of tibiae brown. Base and outer side of mid tibiae yellowish, tarsi yellowish-white. Basal third of hind tibiae yellowish-white, tarsal segments 1—4 whitish. Gaster black. Veins of wings brown.

Median part of clypeal margin very slightly emarginate, almost straight, about 1/3 of total width of margin, lateral angles obtuse. Frons densely punctate. Vertex finely reticulate alutaceous, sparsely finely punctate. POD larger than OOD. Intercarinal space more than half as wide as first basitarsus. Underside of head shining, sparsely punctate. Antennae clavate, segments 10—11 shorter than broad, last segment about 1.5 times as long as broad.

Lateral pronotal angles sharp. Scutum and scutellum finely reticulate alutaceous, finely punctate, interstices mostly a few times size of punctures. Propodeal enclosure shining with large median area. Back of propodeum dull, finely coriaceous and with extremely fine oblique striae, no distinct reticulation. Mesopleura finely reticulate alutaceous, medially a few shallow relatively large punctures, lower part sparsely finely punctate, extreme upper part almost impunctate. Hypo-epimeral area densely superficially punctate, interstices about size of punctures. Anterior oblique suture crenulate, carinae somewhat continued on anterior plate of mesepisternum. Second recurrent vein of fore wings ending in third submarginal cell. Petiole slightly shorter than half first tergite, this tergite about 1.5 times as long as broad. Pygidial area over 2.5 times as long as broad.

Face with silvery appressed pubescence and also with long erect hairs. Pronotal collar appressed silvery pubescent, last tergite golden-brown pubescent, densely so on pygidial area, rest of body whitish pubescent.

Male unknown.

Material examined: 1 ♀, holotype, Texas, San Diego, 16 May, collection Ashmead, labelled: "*Psenia minuta* type det. J. R. Malloch" (USNM, type No. 44230).

New record from Texas: 1 ♀, Sabinal, May 1910, F. C. Pratt (USNM).

The back of the propodeum of this species is unusually finely striate, without distinct reticulation.

Pluto spangleri sp. nov.

Female. — Length about 6 mm. Black. Middle part of mandibles, and labrum reddish. Underside of flagellum orange-brown. Pronotal tubercles and tegulae, foreside of fore tibiae and outer side of mid tibiae, basal 1/3 of hind tibiae and

segments 1—4 of all tarsi whitish. Hind margins of tergites reddish transparent. Veins of wings brown.

Median part of clypeal margin straight, about 1/3 of total width of margin, no distinct lateral teeth, cf. fig. 5 (*pallidistigma*). Frons densely finely punctate. Vertex reticulate alutaceous, sparsely finely punctate. Intercarinal space more than half as wide as first basitarsus, rarely narrower. POD larger than OOD. Antennae clavate, segments 9—11 shorter than broad.

Lateral pronotal angles sharp in dorsal aspect. Scutum finely reticulate alutaceous, finely punctate, interstices larger than punctures, laterally much larger. Scutellum with same microsculpture, sparsely finely punctate. Propodeal enclosure almost shining, central area large, sometimes with an irregular carina. Back of propodeum dull, with oblique and transverse fine striae and some reticulation. Mesopleura finely reticulate alutaceous, punctures shallow, on central part interstices mostly larger than punctures, on lower part and on mesosternum a few times size of punctures. Hypo-epimeral area finely punctate, interstices about size of punctures. Anterior oblique suture foveolate, rugae continued on anterior plate of mesepisternum. Second recurrent vein of forewings ending in third submarginal cell. Petiole about half as long as first tergite, this tergite about 1.5 times as long as broad. Pygidial area about 2.5 times as long as broad.

Face with silvery-whitish appressed pubescence and long erect hairs. Rest of body silvery-whitish pubescent, on vertex and on scutum more yellowish-grey; last tergite including pygidial area with backward directed brown hairs.

Male. — Resembling female, more slender. Length about 6 mm. Fore tibiae yellowish-brown, mid tibiae largely black with yellowish-brown outer streak, extreme base of hind tibiae yellowish-white. Veins of wings brown, stigma dark brown.

Clypeal margin with two indistinct teeth, close together. Antennal segments 11—12 about 1.5 times as long as broad, segments 5—12 with tyloidea, narrow and shorter than segments on segments 5—6 or 5—7, small and oval on segments 7—12 or 8—12, indistinct on segment 13. Punctation of mesopleura stronger and denser, dorsal half anteriorly somewhat striato-punctate. Scutum shining, punctation stronger than in female. Back of propodeum coarsely reticulato-carinate. Petiole somewhat shorter than first tergite, this tergite over twice as long as broad; second tergite about 1.75 times as long as broad.

Mexico: Oaxaca: Tehuantepec, 1 ♀, holotype, 15—16 July 1964, 1 ♂, allotype, 23 July 1964, Paul J. Spangler (USNM). Paratypes: Oaxaca: Tehuantepec, 1 ♀, 15—16 July 1964, 1 ♂, 23 July 1964, Paul J. Spangler (USNM); 3 mi north Huajuápan de Léon, 1 ♀, 8 Sept. 1959, R. H. and E. M. Painter (KU). Chihuahua: 2 ♀ and 2 ♂, 10 mi north Chihuahua, 17 Aug. 1965, H. E. Evans (MCZ); 1 ♀, 11 mi west Gran Morelos, 11 July 1964, J. A. Chemsak (CIS); 1 ♀, 8 mi northeast Hidalgo Del Parral, 13 July 1964, J. A. Chemsak and J. Powell, black and white lights (CIS). Guerrero: 2 ♂, Xalitla, 1500 ft, 3—20 March 1959, H. E. Evans and D. M. Anderson (CU); 1 ♀, Zumpango, 22 July 1963, F. D. Parker and L. A. Stange; 1 ♀, Zihuatanejo, 12 Dec. 1966, G. E. Bohart (UCD). Jalisco: 1 ♀, 15 mi northeast

Guadalajara, 17 Sept. 1970, R. M. Bohart (UCD); 1 ♂, 15 mi north Guadalajara, 22 July 1965, H. E. Evans (MCZ). Michoacan: 5 ♂, 11 mi east Apatzingán, 20 Aug. 1954, E. G. Linsley, J. W. MacSwain, R. F. Smith (UCD, 1 ♂ CAS). Morelos: 1 ♂, Las Estacas, 3000 ft, 6 April 1959, H. E. Evans and D. M. Anderson (CU). Nuevo Léon: 1 ♀, 5 mi south Monterrey, 8 May 1968, Malaise trap, M. W. McFadden (UCD). Puebla: 1 ♂, 3 April 1962, 1 ♀ and 2 ♂, 21 Aug. 1963, 3 mi northwest Petlalcingo, L. A. Stange (UCD). Sinaloa: 1 ♂, 5 mi north Mazatlán, 15 Aug. 1970, Malaise trap 10A-2P, M. Wasbauer and J. Chemsak (CIS). Sonora: 4 ♀ and 14 ♂, 10 mi southeast Alamos, 29 June 1963, F. D. Parker and L. A. Stange; 1 ♀, Alamos, 5 Sept. 1970, R. M. Bohart (UCD). Baja California: 1 ♀, La Laguna, 14 Oct. 1941, Ross and Bohart (CAS). All paratypes.

U.S.A.: Arizona: Graham Co., east foot Pinalejo Mts., 0.9 mi along road to Marijilda Canyon from Highway 666, 3860 ft, 2 ♂, 4 Aug. 1965, Hugh B. Leech; Santa Cruz Co., Yank's Spring, Sycamore Canyon, Tumacacori Mts., 4000 ft, 1 ♀, 28 July 1965, Hugh B. Leech; Santa Cruz Co., Pena Blanca Lake, 9.5 mi westnorthwest Nogales, 4000 ft, 1 ♂, 20 Aug. 1974, on *Kallstroemia grandiflora*, T. J. Zavortink (CAS); Portal, 16 ♀ and 11 ♂, 10 Aug.—7 Sept. 1974, H. and M. Townes; Parker Canyon Lk., 4 ♀, 20 Aug. 1974, H. and M. Townes (HT). Texas: New Braunfels, 1 ♂, 26 July 1942, E. S. Ross (CAS); Cristal City, 1 ♀, July 1945, Weyrauch (IML); Big Bend, 5000 ft, 1 ♀ and 4 ♂, 1 Aug. 1975, S. and J. Peck (HT); Uvalde Co., Speir Rch. 3 mi northwest Uvalde, 1 ♀, 4 May 1977, Malaise trap 9A—5P, T. Eichlin and M. Wasbauer (CIS). All paratypes.

Guatemala: 1 ♀, nr. Guatemala City, 1932, C. N. Ainslie; 1 ♀, El Rancho, 900 ft, 18 Febr. 1932, C. N. Ainslie (USNM). Paratypes. In the female from El Rancho the thorns on the tibiae and on the whitish tarsi are conspicuously dark brown.

The female of *P. spangleri* closely resembles that of *P. minutus* (Malloch) but its petiole is slightly longer, the punctation of the mesopleura medially stronger and closer, the oblique striae on the back of the propodeum are coarser. It seems possible that *P. spangleri* is a subspecies of *P. minutus*, but Texan males of the latter species are needed to obtain certainty. *P. spangleri* probably can also be distinguished by its larger size.

The female of *P. albifacies* (Malloch) is rather similar but it has a longer petiole and its mesopleura are more densely punctate.

Pluto brevipetiolatus (Rohwer)
(fig. 9)

Rohwer, 1910: 100—101, ♀ (*Psenulus (Neofoxia) brevipetiolatus*; California).
Malloch, 1933: 54—55 (*Psenia brevipetiolata*).
Krombein, 1951: 962 (*Pluto brevipetiolatus*, comb. nov.).
Bohart & Menke, 1976: 171.

Female. — Length about 8 mm. Head and thorax black; anterior margin of clypeus and mandibles reddish, underside of flagellum yellowish-red. Pronotal tubercles and tegulae yellowish-white. Fore and mid tibiae and tarsi yellowish-red,

outer side of tibiae and first tarsal segments yellowish-white. Basal third of hind tibiae yellowish-white, tarsal segments yellowish, basal 2/3 of segments pale brown. Gaster black, hind margin of first tergite, hind margin and sides of second tergite and greater part of third tergite reddish, also broad margin of tergites 4—5, last segment dark reddish. Veins of wings brown.

Median part of clypeal margin straight, lateral angles obtuse, no distinct teeth; this part about 1/3 of total width of margin. Frons densely finely punctate, lateral tubercles shining. Vertex and interocellar area finely reticulate alutaceous, sparsely punctate. POD about 1.5 times OOD. Occipital carina complete, ventro-laterally with angle or thickening. Intercarinal space nearly as broad as first basitarsus. Antennae somewhat clavate, segments 10—11 shorter than broad.

Lateral pronotal angles about rectangular. Scutum and scutellum shining, indistinctly alutaceous, finely punctate, interstices on scutum mostly a few times size of punctures, also some micro-punctation; scutellum sparsely punctate. Propodeal enclosure medially irregularly carinate, laterally with some oblique carinae, enclosure not deep, posteriorly not sharply defined. Back of propodeum dull, finely reticulato-carinate, dorso-laterally finely and closely obliquely striate. Hypo-epimeral area dull, very finely and closely but indistinctly punctate, appearing granulose. Mesopleura dull, reticulate alutaceous, irregularly finely punctate, interstices on anterior part a few times size of punctures. Anterior plate of mesepisternum finely obliquely rugose, rugae continuing into anterior oblique suture. Petiole about half length of first tergite, this tergite somewhat longer than broad. Pygidial area narrow, about three times as long as broad (fig. 9). Second recurrent vein of fore wings ending in third submarginal cell.

Pubescence of face silvery, mostly appressed, of pygidial area and sides of last segment dark golden-brown, of rest of body whitish to greyish.

Male unknown.

I have not seen the type, but I could examine the female, which Malloch (1933) studied and compared with the type and which bears the following data: California, Lindsay, 4 June 1923, on *Asclepias*, W. A. Davidson (USNM).

New record from California: 1 ♀, Gavilan Hills, 1 Oct. 1952, A. L. Melander (USNM).

P. brevipetiolatus probably belongs to the group of *angulicornis*, which is characterized by the finely sculptured back of the propodeum and the short petiole. *P. brevipetiolatus* differs from the other species of this group in having an indistinctly punctate hypo-epimeral area and a longer and narrower pygidial area. Unfortunately the male is unknown, so that the provisional placing into this group cannot be confirmed by the shape of its tyloidea.

Pluto rotundus sp. nov.
(fig. 6)

Female. — Length about 7 mm. Head and thorax black. Mandibles yellowish-red, labrum reddish, clypeal margin dark red. Apices of scape of antennae reddish, underside of flagellum orange-brown. Pronotal tubercles yellowish-white. Tegulae

whitish to reddish. Veins of wings dark brown. Fore trochanters and foreside of fore femora reddish-brown, fore tibiae yellowish-red with narrow yellow outer streak, tarsi yellowish-red, basitarsi whitish. Mid femora brown, foreside reddish-brown, tibiae reddish, tarsi whitish, last segment reddish-yellow. Hind femora reddish-brown, tibiae reddish, basal 1/4 yellowish, tarsi whitish, last segment darker. Tergites 1—3, ventral plate of first sternite, sternites 2—4, hind margins of tergites 4—5 and apical part of pygidial area reddish.

Anterior margin of clypeus (fig. 6) rounded, no distinct median part. Disk of clypeus densely punctate, with narrow, shining, depressed margin. Frons medially densely punctate, raised round anterior ocellus which is lying in a relatively deep pit, frons laterally with large oblong, somewhat raised shining area. Vertex almost shining, sparsely punctate, back of head finely striate, POD almost twice OOD. Postocellar and interocellar area raised. Intercarinal space about half as wide as fore basitarsus. Antennae regularly thickening towards apex, segments 10—11 about as long as broad.

Lateral pronotal angles rectangular. Scutum and scutellum finely reticulate alutaceous, punctate, interstices mostly a few times size of punctures, scutum posteriorly with fine short rugae. Propodeal enclosure shining, large median area. Back of propodeum dull, reticulato-carinate. Mesopleura reticulate alutaceous, finely punctate, interstices mostly a few times size of punctures. Hypo-epimeral area dull, densely superficially punctate. Anterior plate of mesepisternum shining, no distinct sculpture, anterior suture narrow, crenulate. Petiole about 2/3 length of first tergite, this tergite about 1.5 times as long as broad. Pygidial area over twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Head and thorax whitish pubescent, gaster with yellowish-grey hairs, face silvery, mostly appressed pubescent, pygidial area dark brown pubescent.

Male unknown.

Florida: 1 ♀, holotype, Lake Placid, 20 June 1962, K. V. Krombein (USNM).

P. rotundus has a slender gaster and whitish hind tarsi, like *P. suffusus*. It differs from the latter species in having a narrower intercarinal space, finer punctation of the mesopleura, brighter colour of the gaster, and a rounded clypeal margin.

The specific name refers to the rounded anterior margin of the clypeus.

Pluto suffusus (Fox)
(fig. 7)

Fox, 1898b: 18, ♀ (*Psen suffusus*; New Mexico).
Ashmead, 1899: 225.
Viereck, 1901: 342, ♀ (*Neofoxia suffusus* Fox).
Smith, H. S., 1908: 66, ♀ (*Neofoxia suffusa* (Fox); Nebraska).
Mickel, 1918: 41, ♀ (*Diodontus suffusa* (Fox)).
Malloch, 1933: 51—52, ♀ and ♂ (*Psenia suffusa*; New Mexico, Arizona, California).
Krombein, 1951: 962 (*Pluto suffusus*, comb. nov.; New Mexico).

Female. — Length about 7 mm. Black. Labrum reddish, mandibles orange-red

or yellowish-red, Clypeal margin more or less reddish. Underside of antennae reddish-yellow. Pronotal tubercles and tegulae yellowish-white. Fore and mid tibiae and tarsi yellowish-brown, outer side of tibiae, basitarsi and one or more of following segments whitish. Basal 1/3 of hind tibiae and hind tarsi except apical half of last segment yellowish-white. Apical half of second tergite, all of third tergite, apical margin of second sternite and all of third sternite red. Veins of wings dark brown.

Median part of clypeal margin almost straight, nearly half total width of margin, laterally indistinctly defined (fig. 7). Lateral parts of frons somewhat raised, densely distinctly punctate. Vertex with reticulate alutaceous microsculpture and sparse punctation. POD almost twice OOD. Intercarinal space as broad as fore basitarsus. Antennae clavate, segments 10—11 shorter than broad.

Lateral pronotal angles about rectangular. Scutum and scutellum finely reticulate alutaceous, sparsely punctate. Back of propodeum reticulato-carinate, not coarsely so, dorsal carinae more parallel. Propodeal enclosure triangular, shining, irregularly carinate. Hypo-epimeral area dull, densely finely punctate. Mesopleura dull, moderately coarsely punctate, on dorsal half interstices about size of punctures, punctures sometimes in rows; on lower part interstices wider than punctures, posterior margin finely coriaceous and rugulose. Mesosternum densely very finely punctate. Petiole nearly as long as first tergite, this tergite about 1.5 times as long as broad. Pygidial area about twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Pubescence of face, thorax and gaster silvery, on face mostly appressed, dense on metanotum and propodeum. Pubescence of pygidial area brown.

Male. — Length about 7 mm. Colour similar to that of female; only basal 1/4 of hind tibiae yellowish, tarsi more whitish, gaster black, hind margins of tergites reddish transparent.

Median part of clypeal margin somewhat protruding, about 1/5 of total length of margin. Intercarinal space about as wide as fore basitarsus. Frons more coarsely punctate. Antennae slender, segments nearly twice as long as broad, last segment longer, segments 5—13 with small and oval tyloides, smallest on segments 5 and 13.

Lateral pronotal angles obtuse. Scutum except for fore margin shining, coarsely punctate with tendency to transverse rugae, interstices mostly smaller than punctures. Scutellum shining, sparsely punctate. Mesopleura with reticulate alutaceous microsculpture, coarsely punctate, partly coarsely rugoso-punctate. Hypo-epimeral area and anterior plate of mesepisternum less coarsely punctate, mesosternum much finer punctate. Back of propodeum coarsely reticulato-carinate. Gaster slender, petiole about as long as first tergite, this tergite about 2.5 times as long as broad.

The following specimens from the collections of the National Museum of Natural History, Washington, which represent most of the material on which Malloch (1933) based his descriptions, have been examined:

New Mexico: 1 ♀, Las Cruces, Cockerell 5016, on *Bigeloria wrightii*, det. *Psenia suffusa* (Fox) by J. R. Malloch; 1 ♀, Las Cruces, Cockerell 5017, USNM acc. no.

30623, det. *Psenia suffusa* by Malloch; 1 ♂, Las Cruces, Cockerell 5105; 2 ♂, Mesilla, 28 July, Cockerell (one ♂ labelled "*Mimesa suffusa* ♂ Fox det. Roh."); 1 ♀, La Luz Sta., 19 Aug. 1930, on *L. alyssoides*; 1 ♂, 2 mi north Vado, 18 Aug. 1929, on *Salsola pestifer*, lot 5823. Arizona: 22 ♂, Higley, 15 July 1917, E. G. Holt; 1 ♂, Mt. Superstition nr. Higley, 24 July 1917, E. G. Holt; 1 ♀, Arizona, 2546, C. F. Baker; 2 ♂, Arizona, 2572, C. F. Baker; 1 ♀, Tucson, collection Ashmead; 1 ♀, Phoenix, 16 Oct., on *Baccharis*, Cockerell. California; 3 ♂, Imperial Co., May 1911, J. C. Bridwell; 1 ♂, Redlands, F. R. Cole; 1 ♀, Antioch, 10 May 1932, E. O. Essig; 1 ♀, Lindsay, 9 Sept., on *Asclepias*, W. A. Davidson; 1 ♀, June 1932, Fowler (USNM).

New records from these states: Arizona: 1 ♀, Phoenix, 8 Aug. 1950, R. S. Beal (USNM); 1 ♀, Globe, 6 Aug., D. K. Duncan, K. V. Krombein det. (KVK); 1 ♀, Tucson, May 1936, Bryant, 139; 1 ♀, Box Canyon, Santa Rita Mts., 29 Aug. 1952, B. Malkin and V. E. Thatcher (CAS); 2 ♀ and 4 ♂, Portal, 11—18 Aug. 1974, H. and M. Townes (HT). California: Fresno Co.: 1 ♀, Fresno, 27 July 1968, T. R. Haig; Imperial Co.: 4 ♂ and 1 ♀, Bard, 14—29 Aug. 1965, ex *Gossypium hirsutum*, R. A. Flock, R. Haygood and H. Ray; 9 ♂, Chocolate Mts., Ogilby Rd. 3 mi south Jct. Hwy. 78, 16—22 Oct. 1977, Malaise trap 8A—5P, M. Wasbauer (CSC); 1 ♀, Seeley, 25 June 1965, ex cotton, R. A. Flock (CSC); Riverside Co.: 2 ♀, Hemet, 24 July 1946, *Helianthus*, J. W. McSwain; 1 ♂, Hopkins Well, 29 April 1952, P. D. Hurd; 1 ♀, Palm Springs, 21 May 1953, A. L. Melander (USNM); San Diego Co.: 1 ♀, Chula Vista, 2 Aug. 1961, on *Atriplex semibacchata*, F. X. Williams (CAS); Sutter Co.: 1 ♂, 2 mi southeast Marysville, 28 June 1962, T. R. Haig (CSC). New Mexico: Don Ana Co., 2 ♂, 13 July 1954, swept from cotton, R. E. Fye (USNM); 1 ♀, Las Cruces, 11 July 1956, H. and A. Howden, at light (CNC); 6 ♀ and 6 ♂, Hatch, 27—30 Aug. 1974, H. and M. Townes (HT); Hidalgo Co.: 1 ♀, Granite Cap, 17 mi north Rodeo, 4 Sept. 1976, F. G. Andrews, collected on *Flourensia cernua*, association *Tachardiella cornuta*, Lacciferiidae (CIS); Otero Co.: 1 ♀, White Sands National Monument, 21 Aug. 1962, H. V. Weems Jr. (FSC).

First record from Florida: 1 ♀, Highlands Co., Archbold Biol. Station, Lake Placid, 21—28 April 1975, K. V. Krombein (USNM).

First records from South Carolina: 1 ♀, Aiken, 12 June 1957, W. R. M. Mason; 1 ♀, Hilton Head Is., 11—23 July 1965, H. F. Howden (CNC). The intercarinal space of these females is somewhat narrower than usual.

First records from Texas: 1 ♀, Knippa, 24 July 1910, F. C. Pratt; 1 ♂, Fabens, 31 Aug. 1945, on cotton (USNM); 1 ♂, 10 mi west Ft. Davis, Pt. Rocks, 5000 ft, 29 May 1959, W. R. M. Mason (CNC).

First records from Mexico: Baja California: La Paz, 1 ♀ and 1 ♂, 29 June 1919, G. F. Ferris, Stanford University (UCD), 3 ♀, 3—5 June 1921, E. P. Van Duzee; 1 ♀, Mulegé, 14 May 1921, E. P. Van Duzee; Escondido Bay, 1 ♂, 14 June 1921, E. P. Van Duzee; San Domingo, 6 ♂, 19 July 1938, Michelbacher and Ross; Sur San José del Cabo, 2 ♂, 17 July 1971, H. G. Real and R. E. Main (CAS). Coahuila: 2 ♂, Boquillas del Carmen, 1850 ft, 23 May 1959, Howden and Becker (CNC). Nayarit: 5 ♂, 2 mi east San Blas, 8 April 1963, G. W. Frankie (USNM). Sinaloa: 1 ♀ and 1 ♂, Guamúchil, 6 May 1953, R. C. Bechtel and E. I. Schlinger (UCD); 1 ♂, Villa

Union, 17 Aug. 1962, H. E. Evans (MCZ). Sonora: 1 ♀ and 1 ♂, 10 mi southeast Alamos, 29 June 1963, F. D. Parker and L. A. Stange (UCD). The tyloidea of the males from Nayarit are dark.

Like Malloch I have not seen the types and I have followed him in his conception of the species. The description of the female by Fox, who had five specimens from Las Cruces and Rincon, New Mexico, before him, is not very clear. He states that the hind tarsi are entirely whitish or ringed with whitish, that either the greater portion of the gaster is black or that reddish prevails and that the punctures of the mesopleura are large and sparse(?), striated posteriorly. A study of his type material and designation of a lectotype is therefore wanted.

The sexual dimorphism is considerable. Although in the collections I have studied the two sexes rarely originate from the same locality, I believe that they have been correctly associated by Malloch.

The female of *P. suffusus* is easily distinquished by the broad intercarinal space, the long petiole, the red tergites and the whitish tarsi. The male has coarsely punctate mesopleura, small tyloidea on antennal segments 5—13 and whitish tarsi. Confusion of the female with *P. sayi* by Fox, as suggested by Malloch, does not seem to be very likely.

Pluto biformis sp. nov.

Male. — Length about 6 mm. Black; mandibles reddish-brown, apex of flagellum orange-brown below. Pronotal tubercles whitish. Tegulae yellowish. Fore femora largely orange-brown, fore and mid tibiae entirely so; basal 1/3 of hind tibiae, tarsi except for last segment of hind tarsi yellowish-white. Veins of wings dark brown. Hind margins of tergites reddish transparent.

Median 1/3 of clypeal margin somewhat depressed and protruding, almost straight. Frons densely punctate. Vertex shining, behind ocelli densely punctate, laterally with larger interstices. Back of head and tempora finely striate. Intercarinal space narrow, occipital carina distinct. Antennae slender, segments quadrate or slightly longer than broad, last segment about twice as long as broad, segment 6 with short narrow tyloides near apex, segments 7—8 with long narrow tyloides, segment 9 with long tyloides widening towards apex, segments 10—12 with broad oval tyloides, shorter than segments; tyloidea on segments 8—12 angularly raised on apical 1/3 when seen in lateral aspect.

Lateral pronotal angles sharp. Scutum shining, interstices often a few times size of punctures. Scutellum shining, sparsely punctate. Median part of enclosed area of propodeum irregularly carinate, back of propodeum irregularly, moderately coarsely reticulato-carinate. Mesopleura alutaceous, coarsely punctate, on upper part interstices larger than punctures, on lower part more densely punctate, on median part punctures partly in rows. Hypo-epimeral area dull, densely punctate, interstices distinct. Mesosternum densely finely punctate. Second recurrent vein of fore wings ending well in third submarginal cell. Petiole about 2/3 length of first tergite, this tergite about 1.5 times as long as broad.

Pubescence of face silvery, mostly appressed, of rest of body whitish. Wings whitish pubescent (freshly emerged?).

Female unknown.

Mexico: 1 ♂, holotype, Durango, 6 mi east Durango, 6500 ft, 24 July 1964, L. A. Kelton (CNC).

This male seems to be closely related to *P. angulicornis* (Malloch), but the tyloidea are distinctly different.

The specific name refers to the tyloidea on the antennae of the male, which are partly narrow, partly broad oval.

Group of *texanus*

Pluto texanus (Malloch)
(fig. 8)

Malloch, 1933: 56, ♀ and ♂ (*Psenia texanus*; Texas).
Krombein, 1951: 962 (*Pluto texanus*, comb. nov.).
Bohart & Menke, 1976: 171.

Female. — Length about 6 mm. Head and thorax black, mandibles yellowish-red with darker tips, labrum reddish. Antennal segments 4—12 yellowish-brown below. Pronotal tubercles yellowish-white. Tegulae reddish transparent. Fore and mid tibiae reddish-yellow with ivory-white outer streak. Basal third of hind tibiae yellowish-white. Fore and mid tarsi whitish to yellowish-brown, hind tarsi dark brown, apices of segments 1—4 yellowish-brown. Hind margin of first gastral tergite, all of second tergite and sides of third tergite red. Hind margins of tergites 3—5 and greater part of sternites red. Veins of wings brown.

Apex of clypeus very slightly protruding, almost straight, median part slightly protruding, laterally with distinct small tooth (fig. 8). Disk of clypeus closely punctate. Frons densely finely punctate. Vertex almost shining, sparsely punctate. Intercarinal space less wide than fore basitarsus. Antennae clavate, segments 8—11 shorter than broad, last segment about 1.5 times as long as broad.

Lateral pronotal angles rectangular. Scutum shining, finely punctate, interstices a few times size of punctures; narrow hind margin finely striato-punctate. Scutellum shining, sparsely punctate, lateral and posterior margins finely rugoso-punctate, no distinct median line. Propodeal enclosure somewhat shining, laterally with oblique carinae, medially irregularly carinate. Back of propodeum coriaceous and moderately coarsely reticulato-carinate, dorso-lateral carinae somewhat parallel. Mesopleura weakly shining, regularly finely punctate, interstices a few times size of punctures, posterior margin coriaceous with very fine striae. Hypo-epimeral area with fine punctures and striae, posterior margin with coarser rugae. Anterior plate of mesepisternum finely striate, oblique suture crenulate. Petiole about 3/4 length of first tergite, this tergite somewhat longer than broad. Pygidial area about twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Pubescence of face silvery, appressed and also with some long erect hairs, tempora with short silvery pubescence. Pygidial area with reddish-brown backwards directed hairs, vertex and rest of body greyish-white pubescent.

Male. — Slender. Length about 5 mm. Fore and mid tibae yellowish-red with narrow yellow streak on outer side, tarsi whitish to yellowish-brown. Apical margin of first tergite, second tergite, except for a black band in front of hind margin and base of third tergite, red.

Apex of clypeus slightly protruding, almost straight. Third antennal segment about 1.75 times as long as broad, following segments longer than broad, last segment nearly twice as long as broad. Segments 4—7 with shining, black narrow tyloidea, on segment 4 about 2/3 length of segment, on segments 5—7 gradually decreasing in length, on segment 8 about 1/4 length of segment, on segments 9—10 a very small but distinct shining point which is also visible in lateral view, tyloidea on segments 11—12 linear, about 1/3 of length of segment on segment 11, a little longer on segment 12.

Mesopleura strongly punctate, interstices on upper part about size of punctures, on median part punctures more in rows. Hind margin of mesopleura and hypo-epimeral area rugose. Scutum shining, punctate, interstices mostly about twice size of punctures. Scutellum somewhat shining, irregularly punctate. Back of propodeum coarsely reticulato-carinate. Gaster slender, petiole about as long as first tergite, this tergite about 1.5 times as long as broad.

Material examined: 1 ♀, paratype, and 1 ♂, allotype, Brownsville, Texas, 1921, J. C. Bridwell (USNM, type No. 44226).

New records from Texas: 1 ♂, Dallas, 421 (NMW); 1 ♀, Olivia, 9 July 1956, D. H. Habeck (NCSU).

The male of *P. texanus* was not included in Malloch's key to the species. In his brief description he did not pay attention to the irregular tyloidea, but he only mentioned that there is "no evident sensory elevation on the second flagellar segment".

Pluto littoralis (Malloch)
(fig. 10)

Malloch, 1933: 56—57, ♀ and ♂ (*Psenia littoralis*; Maryland).
Krombein, 1951: 962 (*Pluto littoralis*, comb. nov.); 1954: 233 (Florida); 1958: 189.
Bohart & Menke, 1976: 171.

Female. — Length about 6—7 mm. Head and thorax black. Mandibles yellowish-red with darker tips, labrum dark reddish. Antennal segments 4—12 orange-brown below. Pronotal tubercles yellowish-white. Tegulae reddish transparent. Fore and mid tibiae reddish-yellow with ivory-white outer streak, mid tibiae below sometimes brownish. Basal third of hind tibiae yellowish-white. Fore and mid tarsi whitish to yellowish-brown, hind tarsi dark brown, segments 1—4 with paler apex. Apical margin of tergite 1, all of second tergite, base or sides of tergite 3 and sternites 2—3 red. Hind margins of segments 3—5 somewhat reddish transparent, apex of last segment dark reddish. Veins of wings brown.

Clypeal margin like that of *P. texanus* but median part almost straight, laterally with distinct short tooth. Disk of clypeus closely punctate. Frons densely finely punctate. Vertex sparsely punctate, posteriorly indistinctly transversely striate. Intercarinal space nearly as wide as fore basitarsus. Antennae clavate, segments 7—11 shorter than broad, last segment about 1.5 times as long as broad.

Lateral pronotal angles almost rectangular. Scutum shining, distinctly punctate, interstices a few times size of punctures; on central part punctures closer, narrow hind margin striato-punctate. Anterior half of scutellum with two large impunctate or nearly impunctate shining areas (in allotype scutellum slightly deformed), lateral margins punctate, hind margin narrowly striato-punctate. Propodeal enclosure somewhat shining, lateral parts obliquely striate, median part irregularly carinate. Propodeum with reticulate alutaceous microsculpture and behind enclosed area rather finely reticulate, posteriorly and laterally coarsely reticulate, dorso-lateral carinae somewhat parallel. Greater part of metapleura shining, upper third dull. Mesopleura with reticulate alutaceous microsculpture, distinctly punctate, sometimes somewhat striato-punctate, interstices mostly as large as punctures, partly larger, posterior margin granulose. Hypo-epimeral area with fine punctures and more or less distinct longitudinal rugae, at least on posterior part. Anterior oblique suture coarsely foveolate, anterior plate of mesepisternum very finely striate. Petiole about 2/3 or 3/4 length of first tergite, about half as long as hind trochanter and femora together. First tergite slightly longer than wide. Pygidial area less than twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Pubescence of face silvery, appressed and also with some long erect hairs, tempora with short whitish pubescence. Pygidial area with backward directed reddish-brown hairs. Vertex and remainder of body greyish-brown pubescent.

Male. — More slender than female. Length about 6 mm. Mid tibiae not distinctly whitish. Apical margin of first tergite, second tergite except for a broad black band in front of hind margin, and base of third tergite red.

Median part of clypeal margin straight, slightly protruding. Intercarinal space narrower. Third antennal segment about twice as long as broad, following segments longer than broad, last segment over twice as long as broad. Segments 4—7 with narrow, shining black tyloides, on segment 4 about 2/3 length of segment, on segments 5—7 gradually decreasing in length, small or indistinct on segment 8, absent or very indistinct on segments 9—10, narrow and usually paler on segments 11—12, on segment 11 about 1/3 length of segment, on segment 12 somewhat shorter than segment, indistinct on segment 13. Malloch's description of the antennae of the male does not agree with the antennae of the type which Dr. A. S. Menke kindly sent me for study. Malloch states that the "sensory areas are almost linear, black, entire, present on all but the basal and apical segments, and sometimes rudimentarily so on apical one", hereby overlooking that the tyloidea on segments 8—10 are rudimentary or absent.

Scutum shining, strongly punctate, interstices on median part larger than punctures. Punctation of mesopleura somewhat coarser than in female; hypo-epimeral area and posterior margin of mesopleura coarsely rugose. Reticulation

on back of propodeum coarser than in female, carinae not parallel. Petiole about as long as hind femur or as long as first tergite, this tergite about 1.5 times as long as wide.

Base of genital apparatus (fig. 10) brown, middle part white and narrowed apex dark brown. Inner margin of stipes triangularly emarginate.

Material examined: Maryland, Chesapeake Beach, 1 ♂, holotype, 3 July 1924, J. R. Malloch, "*Psenia littoralis* type det. J. R. Malloch"; 1 ♀, allotype, 2 July 1916, W. L. McAtee (USNM, type No. 44227).

New records from U.S.A.: Florida: Placida, 1 ♀, 11 April 1952, G. S. Walley; Punta Gorda, 1 ♂, 2 April 1953, K. V. Krombein, K. V. Krombein det. (KVK); Cedar Key Levy Co., 8 ♀ and 12 ♂, 19 Aug., 16—28 Sept. and 12 Oct. 1975, two ♀ with prey (small leafhoppers), E. E. Grissell (FSC); 1 ♀ and 1 ♂, 19 Aug. 1975, E. E. Grissell (USNM); Gulf Co., St. Joseph St. Park, 1 ♀ and 3 ♂, 1—3 May (1970), W. W. Wirth (USNM); Cudjoe Key, Monroe Co., 3 ♀, 12 July 1971, W. H. Pierce (FSC). North Carolina: Bogue Banks, 2 ♂, 14 Sept. 1959, *Salicornia*, L. Davis; North R., 1 ♀, 5 Sept. 1959 and 1 ♂, 6 June 1960, L. Davis (USNM). South Carolina: Fripp Island Beaufort Co., 1 ♀ and 2 ♂, 26 Sept. 1973, G. C. Steyskal (USNM).

The three females from Cudjoe Island have somewhat weaker and more widely placed punctures on the mesopleura. One of the males from Cedar Key has also on the antennal segment 10 a distinct tyloides or at least a distinct tubercle.

P. littoralis and *P. texanus* are very similar. In the female of *P. littoralis* the mesopleura are somewhat coarser and more densely punctate, the hind margin is more coarsely rugose. The scutum is more densely punctate. The male of *P. littoralis* has no distinct tyloidea on antennal segments 9—10, the allotype of *P. texanus* has very small but distinct tyloidea on these segments.

Further studies may prove that *P. littoralis* is a geographic subspecies of *P. texanus*.

Group of *sayi*

Pluto sayi (Rohwer)
(fig. 11)

Cresson, 1872: 227, ♀ (misidentified as *Mimesa pauper* Packard; Texas).
Rohwer, 1910: 100, ♀ (*Psenulus (Neofoxia) sayi*; Kansas, Texas).
Malloch, 1933: 55—56, ♀ and ♂ (*Psenia sayi*; Alabama, Arizona, California, District of Columbia, Louisiana, New Mexico, Texas).
Krombein, 1951: 962 (*Pluto sayi*, comb. nov.; Austral zone east of California); 1967: 396 (California).
Bohart & Menke, 1976: 171.

Female. — Length about 5.5 mm. Head and thorax black; labrum reddish, mandibles reddish with darker tips, underside of flagellum yellowish-red. Pronotal tubercles and part of tegulae yellowish-white. Outer side of fore and mid tibiae, basal third of hind tibiae and fore and mid basitarsi yellowish-white. Remainder of

fore and mid tarsi brownish, hind tarsi except for apices of segments 1—4 dark brown. Gaster largely black; hind margin of first tergite, all of second tergite, great part of third tergite and all of sternites 2—3 usually red (sometimes more tergites and sternites), apex of last gastral segment dark reddish. Veins of wings dark brown.

Median part of clypeal margin very weakly emarginate with short lateral teeth (fig. 11). Frons raised, densely punctate. Vertex shining, indistinctly alutaceous, sparsely punctate. POD larger than OOD. Occipital carina complete, intercarinal space narrow. Antennae clavate, segments 10—11 shorter than broad.

Lateral pronotal angles about rectangular. Scutum shining, rather strongly punctate, interstices mostly a few times size of punctures, medially smaller. Scutellum sparsely finely punctate, hind margin dull. Propodeum dull, enclosure without large median area, back irregularly reticulato-carinate, dorso-lateral carinae mostly parallel. Mesopleura somewhat shining but distinctly reticulate alutaceous, finely punctate, interstices larger than punctures or a few times larger than punctures, interstices largest on upper part; hind margin finely coriaceous. Punctation of mesosternum finer, interstices about size of punctures. Hypo-epimeral area somewhat shining, finely alutaceous and punctate, punctures smaller than on mesopleura, interstices about size of punctures. Petiole about 2/3 length of first tergite, this tergite about as long as broad. Pygidial area about twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Pubescence of face silvery, mostly appressed. Hairs on pygidial area golden brown, remainder of body whitish pubescent.

Male. — Length about 4.5—5 mm. Gaster black, hind margins of tergites reddish, sometimes second tergite and base of third tergite red, especially in males from Arizona and California. Antennal segments nearly 1.5 times as long as broad, segments 5—12 with linear tyloides, shorter on segment 12, sometimes also an indistinct tyloides on segment 4. Punctation of scutum and mesopleura coarser than in female. Interstices on upper part mesopleura larger than punctures, on median part smaller. Mesopleura sometimes shining, especially in males from Arizona and California, which are often also smaller (3.5—4 mm). Hypo-epimeral area dull, finely punctate, interstices larger than punctures, at least on lower part. Propodeum somewhat coarser reticulate than in female. Petiole nearly as long as first tergite, this tergite about 1.5 times as long as broad.

Material examined: 1 ♀, paratype, Texas [Bosque Co., coll. G. W. Belfrage], with labels "*Mimesa pauper* Pack." and "*Neofoxia sayi* Roh. paratype" (USNM, type No. 12856).

Alabama: 1 ♀ and 17 ♂, 2280, C. F. Baker. Arizona: 1 ♂, 2546, C. F. Baker, 43 ♂, Higley, 15 July 1917, E. G. Holt, 1 ♂, Higley, 25 June 1917, E. H. Holt, 1♂ Sacaton, sweeping pomegranate. California: 1 ♂, Lindsay, 6 Sept. 1925, on *Helianthus*, W. A. Davidson. Louisiana: 2 ♀ and 6 ♂, 2336, 1 ♀ and 2 ♂, 2392, C. F. Baker, 2 ♀ and 1 ♂, Opelousas, G. R. Pilate. New Mexico: 1 ♂, Albuquerque, 3240, Cockerell (USNM). This is probably all material studied and recorded by Malloch.

New records from U.S.A.: Alabama: 9 ♀ and 16 ♂, Montgomery, 23—27 June, K. V. Krombein (KVK and ML). Arizona: Tucson, 1 ♂, 30 May 1920, F. X. Williams (CAS), 3 ♀ and 2 ♂, 9—18 June 1938, R. H. Crandall, det. K. V. Krombein (KVK); 1 ♂, Sta. Rita Mts., 20 Sept. 1936, Bryant, Lot 41; 1 ♂, Oak Creek Canyon, 6 June 1940, G. E. Bohart (CAS); 7 ♂, Benson, San Pedro River, 7 June 1968, Menke and Flint (USNM). California: Imperial Co.: 2 ♀, "Imperial Co.", May 1911, J. C. Bridwell (USNM); Imperial, 3 ♂, 28 June—14 July 1965, ex cotton and ex *Gossypium hirsutum*, Collins and R. Pineda; Seeley, 2 ♀ and 54 ♂, 2 July 1965, ex *Gossypium hirsutum*, L. Pineda and H. Ray, 1 ♀, 28 June 1965, ex cotton, Collins, 1 ♂, 9 Aug. 1971, ex cotton, R. A. Flock and Pineda; Bard, 1 ♀ and 19 ♂, 22 June—17 July 1965, 2 ♀ and 2 ♂, 18 Aug.—8 Sept. 1965, ex *Gossypium hirsutum*, H. Ray, R. Haygood and R. A. Flock; El Centro, 1 ♀ and 6 ♂, 12—13 July 1965, ex *Gossypium hirsutum*, R. A. Flock, 1 ♂, 13 July 1965, ex cotton, R. A. Flock; Calexico, 3 ♂, 8 June 1965, ex cotton, R. A. Flock; Brawley, 1 ♂, 14 June 1965, ex cotton, Pineda; Holtville, 3 ♂, 8 July 1965, ex *Gossypium hirsutum*, R. A. Flock; Westmorland, 1 ♂, 15 June 1965, ex *Gossypium hirsutum*, L. Pineda (CSC); Westmorland, 3 ♂, 15 May 1974, H. and M. Townes, G. and C. Townes (HT); Ventura Co.: Holtville, 3 ♂, 26 Sept. 1968, ex *Sorghum*, Cal. Dept. Agric., No. 68J 9—17, R. A. Flock, *Pluto sayi* det. M. Wasbauer 1968 (CSC); San Bernardino Co.: 4 ♂, Chino, 13 July 1965, ex *Zea mays*, Birdsall coll. (CSC); Fresno Co.: Clovis, 2 ♂, 31 May 1974, ex almond, Peregrin coll.; Kerman, 1 ♂, 26 June 1972, ex alfalfa, Moré coll. (CSC); Sacramento Co.: American River, 1 ♀, 15 June 1966, M. S. Wasbauer (CSC); Stanislaus Co.: 1 ♀, Del Puerto Canyon, Frank Raines Park, ca. 1100 ft, 4 July 1971, P. H. and M. Arnaud (CAS); Yolo Co.: Davis, 1 ♂, 5 July 1975, W. J. Pulawski (BM); Riverside Co.: 1 ♀ and 5 ♂, Blythe, E. P. Van Duzee (CAS). District of Columbia: 3 ♀, Washington, 16—25 Aug. 1949, R. Boettcher, D. G. Shappirio coll. (USNM). Florida: 1 ♂, Winter Park, 8 Aug. 1940, H. T. Fernald (hind tarsi pale; with label "*Pluto* nr. *tibialis*"), 1 ♀ and 2 ♂, Arcadia, 30 June—2 July 1962, K. V. Krombein, 1 ♂, Hialeah, 21 July 1965, C. Stegmaier (USNM); 1 ♂, Fort Myers, Lee Co., 26 April 1967, P. P. Babiy (BSM); 1 ♂, St. Joseph, Gulf Co., (T.H. Stone Memorial) State Park, 4 May 1973, C. R. Artaud (FSC). Iowa: 10 ♀ and 2 ♂, Sioux City, 13 July 1927, 23 July 1931, 6 July 1933, 19—30 July 1934, 1 ♀ and 1 ♂, without date, C. N. Ainslie; 1 ♂, County, No. 47, 4 July 1932, Russell (USNM). Kansas: 1 ♀, Clay Co., Aug., Bridwell, labelled "*Neofoxia suffusus* Fox ♀ Bridwell det. 1905"; 1 ♂, Dickinson Co., Aug. 1901, Bridwell, labelled "*Neofoxia suffusus* Fox ♂ Bridwell det. 1905"; 1 ♀ and 1 ♂, Baldwin June, Bridwell; 1 ♂, Clay Co., Aug. 1901, Bridwell; 2 ♂, Manhattan, Ac. 4777 and 4782 Sp., Wm. P. Hayes (USNM); 1 ♀, 7 mi east Washington, 8 Aug. 1973, E. S. Ross (CAS). Louisiana: 1 ♂, Tallulah, 8 July 1948, Bug Catcher Exp., R. C. Gaines (USNM); 1 ♀, Rapides Parish, 1 June 1973, Peter Rush (HT). Missouri: Kansas City, 1 ♂, 9 Aug. 1934, R. H. Crandall (KVK); 1 ♀, Roaring River State Park, 15 June 1954, J. Green (CAS); Columbia, Boone Co., 1 ♀ and 1 ♂, 17 Aug. 1966, 9 ♀ and 12 ♂, 26 June—30 Aug. 1967, 2 ♀, 31 Aug. 1968, Malaise trap, F. D. Parker (USNM). New Mexico: 1 ♂, Dona Ana Co., 17 Aug. 1954, swept from cotton, R. E. Fye, 2 ♀, 3 mi southwest Las Cruces, 2 Aug. 1929, on

Salsola pestifer, V. E. Romney, one ♀ labelled "*Psen tibialis* Cr. det. Malloch 1930" (USNM). North Carolina: Raleigh, 2 ♀ and 1 ♂, 10 Sept. 1940, 2 ♂, 24 July 1941; 1 ♂, Faison, 9 June 1953, on celery, T. B. Mitchell; 1 ♀, Hyde Co., 5 June 1959, David A. Young; 1 ♀, Robbinsville, 28 July 1959, David A. Young (NCSU). South Carolina: 2 ♀ and 3 ♂, Columbia, 8—19 Aug. 1951, L. and G. Townes (HT). Tennessee: 2 ♀ and 17 ♂, Madison, Davidson Co., 9 June—3 Aug. 1967, P. P. Babiy (BSM). Texas: 2 ♀, Presidio, 2 April—9 May 1941, W. L. Lowry, Box 1, traps pink bollworm larvae installed, Lot No. 41—7893, *Pluto sayi* det. K. V. Krombein (USNM); 1 ♂, Dallas, No. 421 (NMW). Virginia: Clifton, 1 ♂, 12 June 1933, J. C. Bridwell (USNM); 1 ♀, 30 June 1935, K. V. Krombein; Arlington, 1 ♀ and 4 ♂, 7—22 June 1947, K. V. Krombein (KVK).

First records from Mexico: Chihuahua: 1 ♂, 9 mi south Hidalgo de Parral, 31 July 1967, R. C. Gardner, C. R. Kovacic and K. Lorenzen (UCD). Coahuila: 2 ♂, Boquillas del Carmen, 1850 ft, 23 May 1959, Howden and Becker (CNC). Nayarit: 1 ♂, Acaponeta, 4 May 1953, R. C. Bechtel and E. I. Schlinger (CIS). Nuevo Léon: 1 ♀, 16 mi south Montemorelos, 19 July 1954, Univ. Kansas Mex. Exped. (UK). San Luis Potosí: 1 ♀, El Bonito, 7 mi south Ciudad Valles, 300 ft, 19 Dec. 1970, P. H. and M. Arnaud (CAS). Sinaloa: 2 ♀, 8 mi south Elota, 18 May 1962, F. D. Parker (UCD). Veracruz: 1 ♀, Boca del Rio, 23 June 1961, Univ. Kansas Mex. Exped., on flowers of *Eupatorium* (UK); 1 ♀, Cordoba (Veracruz?), Mann (MCZ). Tergite 2 of lastmentioned female is almost entirely dark brown.

First records from El Salvador: 1 ♂, San Andrés, 6 June 1958, O. L. Cartwright (USNM) (this male has no tyloides on segment 12); 1 ♂, Usulután, 50 ft, 12 July 1963, D. Q. Cavagnaro and M. E. Irwin (CAS).

First record from Nicaragua: 1 ♀, San Juan Managua, 30 May 1960, M. Vaughan (USNM).

First records from Cuba: 2 ♀, San Vicente, Pinar del Rio, July 1940, J. C. Bradley (CU).

The mesopleura of specimens from Arizona, California, Texas and from Mexico are more shining and somewhat more coarsely punctate, especially in the males from Arizona. Females from these regions often have tergites 2—3, sometimes also tergites 1 and 4, entirely red; in the males too the red colour on the gaster is more extended than in those from Alabama and Louisiana. The mesopleura of the females from Nicaragua and Cuba are dull, distinctly reticulate alutaceous. One of the males from Florida has very pale, almost yellowish hind tarsi.

Pluto stenopygidialis sp. nov.
(figs. 12—13)

Female. — Length about 6 mm. Black: mandibles and underside of flagellum reddish-brown; tibiae, tarsi and tegulae largely dark brown.

Median part of clypeal margin broad, almost straight, sharp lateral angles, in the middle very weakly protruding, margin depressed (fig. 12). Clypeal disk convex, closely finely punctate. Frons densely punctate, vertex alutaceous, finely punctate and indistinctly transversely striate. Tempora finely striate. POD nearly twice

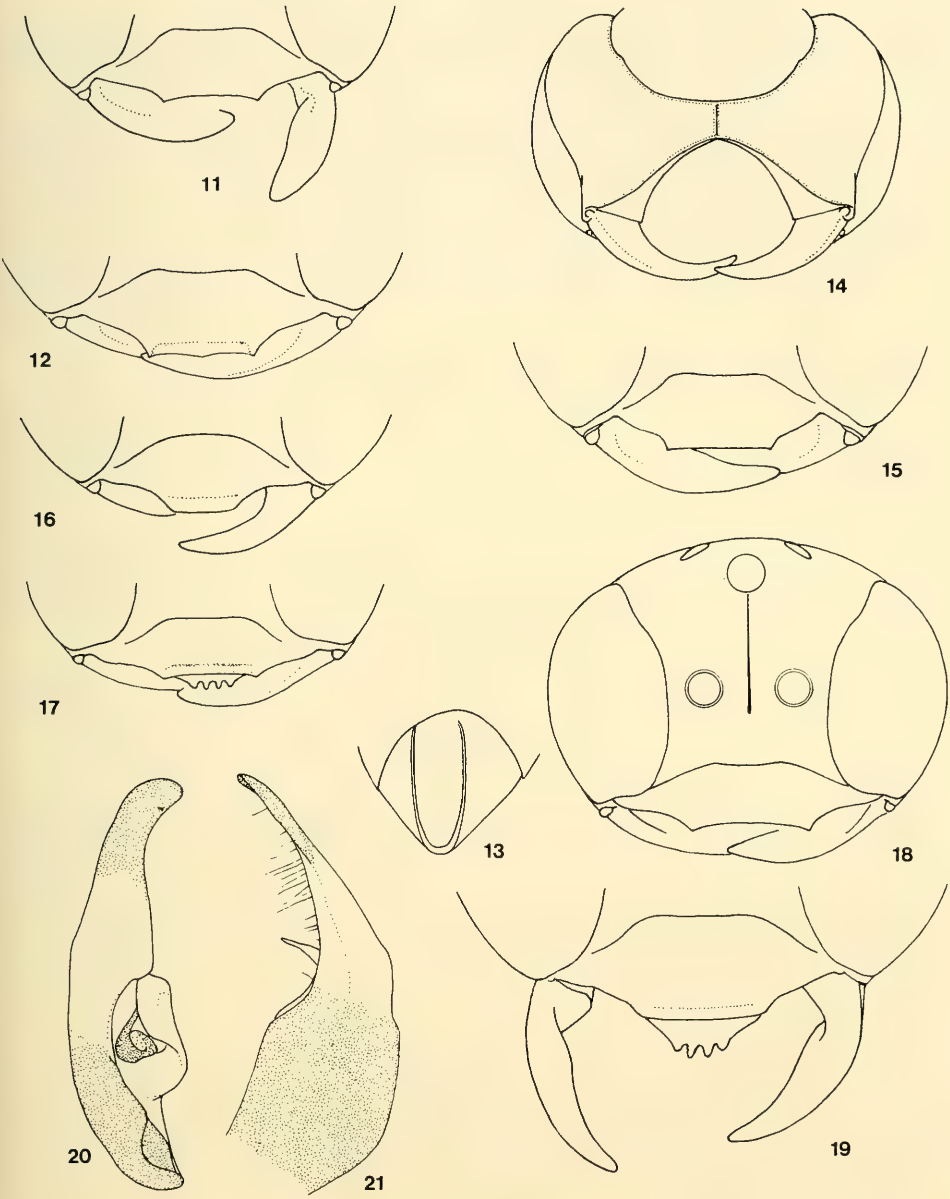


Fig. 11. *Pluto sayi* (Rohwer), ♀, clypeus. Figs. 12—13. *P. stenopygidialis* sp. n., ♀, holotype; 12, clypeus; 13, pygidial area. Fig. 14. *P. jugularis* sp. n., ♀, holotype, head in ventral aspect. Fig. 15. *P. punctatellus* sp. n., ♀, holotype, clypeus. Fig. 16. *P. aerofacies* (Malloch), ♂, allotype, clypeus. Fig. 17. *P. evansi* sp. n., ♀, holotype, clypeus. Fig. 18. *P. emarginatus* sp. n., ♀, holotype, head in frontal aspect. Figs. 19—21. *P. rufibasis* (Malloch); 19, clypeus of ♀; 20—21, left paramere of ♂, ventral and lateral aspect.

OOD. Intercarinal space about half width first basitarsus. Antennae short, segments 10—11 about as long as broad.

Lateral pronotal angles obtuse. Scutum shining, finely punctate, interstices often a few times size of punctures. Scutellum almost shining, sparsely punctate. Propodeal enclosure almost flat, carinae fine, medially irregular. Back of propodeum dull, mostly finely obliquely striate. Mesopleura reticulate alutaceous, upper half rather strongly irregularly punctate, partly striato-punctate, lower part very finely very sparsely punctate, posterior margin finely coriaceous. Mesosternum densely finely punctate. Hypo-epimeral area finely punctate, interstices at least size of punctures. Anterior oblique suture narrow, foveolate, anterior plate of mesepisternum dull, sparsely punctate. Metapleura largely reticulate alutaceous. Petiole about half length first tergite, this tergite somewhat longer than broad. Pygidial area narrow, over 2.5 times as long as broad (fig. 13). Second recurrent vein of fore wings ending in third submarginal cell.

Face dark brown-golden pubescent, not appressed, also a number of long erect hairs. Vertex and scutum brownish pubescent, pubescence of mesopleura yellowish-grey, of back of propodeum silvery-white, of pygidial area dark brown.

Male unknown.

Arizona: 1 ♀, holotype, near Roosevelt Lake, 29 April 1947, H. and M. Townes (KVK); 1 ♀, paratype, Parker Canyon Lk., 22 Aug. 1974, H. and M. Townes (HT).

This female keys out near *P. punctatellus*, but is easily distinguished by the brown-golden, not appressed pubescence of the face and by the dark legs.

The specific name refers to the narrow pygidial area of the female.

Pluto jugularis sp. nov.
(fig. 14)

Female. — Length about 6 mm. Head and thorax black. Mandibles yellowish-red with darker tips, labrum reddish. Underside of flagellum yellowish-red. Pronotal tubercles yellowish-white, tegulae yellowish. Apices of fore and mid femora, all of fore and mid tibiae and tarsi, basal 2/5 of hind tibiae and apices of hind tarsal segments 1—4 yellowish. Tarsal claws of mid legs brownish. Hind margin of tergite 1, all of tergites 2—3 and sternites 2—3 red, hind margins of following segments reddish transparent. Veins of wings brown.

Clypeal margin resembling that of *P. sayi* (fig. 11), protruding median part over 1/3 of total width of margin, weakly emarginate, lateral teeth small. Disk of clypeus densely finely punctate. Frons except for sides densely finely punctate. Vertex reticulate alutaceous, sparsely finely punctate. Tempora almost smooth. POD somewhat larger than OOD. Occipital carina complete, intercarinal space broader than first basitarsus (fig. 14). Antennae short, clavate, segments 9—11 shorter than broad, segment 12 about 1.5 times as long as broad.

Lateral pronotal angles about rectangular. Scutum and scutellum finely reticulate alutaceous, sparsely finely punctate, near hind margin more densely punctate. Scutellar suture crenulate. Propodeal enclosure shining, with large irregular median area. Back of propodeum coriaceous, moderately finely

reticulato-carinate, dorso-lateral carinae almost parallel. Mesopleura, hypo-epimeral area and anterior plate of mesepisternum finely reticulate alutaceous, mesopleura minutely punctate, hypo-epimeral area almost imperceptably (× 30) punctate, interstices on mesopleura a few times size of punctures, its hind margin dull, coriaceous. Mesosternum densely distinctly but finely punctate. Anterior oblique suture finely crenulate. Petiole somewhat shorter than first tergite, this tergite about as long as broad. Pygidial area about 1.5 times as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Face and pronotal collar with silvery, mostly appressed pubescence. Pubescence of tempora and mesosternum silvery, of vertex, scutum and scutellum brownish, of pygidial area reddish-brown, of rest of body yellowish-grey.

Male unknown.

Brazil: 1 ♀, holotype, Corumbá, Mato Grosso, 14—23 Dec. 1919 (CU).

P. jugularis resembles *P. sayi* but is easily distinguished by the broad intercarinal space and the other characters mentioned in the key.

The specific name refers to the posterior part of the underside of the head with broad intercarinal space.

Pluto punctatellus sp. nov.
(fig. 15)

Female. — Length about 7 mm. Black. Mandibles, labrum and underside of flagellum reddish. Pronotal tubercles dark brown or pale brown. Fore tibiae and tarsi yellowish-brown, tibiae more or less darkened; base and apex of mid tibiae and entire tarsi yellowish-brown, last segment darker brown; hind tibiae and tarsi brown, bases of tibiae and apices of tarsal segments paler. Veins of wings dark brown. Hind margins of gastral segments reddish transparent, last segment dark reddish.

Slightly protruding median part of clypeus almost straight, about half total width of clypeal margin, laterally a weak tooth (fig. 15). Frons densely finely punctate, lateral tubercles and vertex shining, almost impunctate. POD about equal to OOD. Intercarinal space narrow. Antennae slightly clavate, segments 9—11 about as long as broad.

Lateral pronotal angles almost rectangular. Scutum and scutellum very finely alutaceous, almost shining, irregularly punctate, on lateral parts interstices a few times size of punctures, hind margin with short fine rugae. Scutellum very sparsely punctate. Propodeal enclosure shining, large median area. Back of propodeum dull, finely coriaceous, reticulato-carinate with some dorso-lateral parallel oblique carinae. Mesopleura finely reticulate alutaceous, regularly minutely punctate, interstices larger than punctures, hind margin with short rugae; punctation of hypo-epimeral area even finer, surface dull. Anterior plate of mesepisternum dull, oblique suture narrow, crenulate. Petiole about 2/3 length of first tergite, this tergite little longer than broad. Pygidial area about 1.5 times as long as broad. Second recurrent vein of fore wings interstitial or ending in third submarginal cell.

Pubescence whitish, on vertex and scutum greyish-brown, on face silvery, rarely golden, mostly appressed. Pygidial area with golden-brown, mostly appressed, pubescence.

Male. — Resembling female. Apex of last antennal segment below dark brown. Fore and mid tibiae almost entirely reddish-yellow. Hind tarsal segments 1—4 yellowish-brown, base of basitarsus paler. Pronotal tubercles somewhat yellowish. Tergites with broad reddish hind margin.

Slightly protruding median part of clypeus about 1/3 of total width of clypeal margin. Antennal segments about 1.5 times as long as broad, segment 13 over twice as long as broad, segments 4—11 with reddish linear tyloidea. Vertex finely transversely striate and sparsely punctate. Scutum more strongly punctate than in female, posterior part rugoso-punctate. Mesopleura much more strongly punctate than in female, partly striato-punctate, a few wide interstices beneath hypo-epimeral area. Hypo-epimeral area reticulate alutaceous, finely punctate, interstices as large as or larger than punctures. Back of propodeum coarsely reticulato-carinate. Gaster slender, petiole about as long as first tergite, this tergite about 1.5 times as long as broad.

El Salvador: Quezaltepeque, 1 ♀, holotype, 16 July 1963, 1 ♂, allotype, 17 July 1963; paratypes: 2 ♂, 5 mi north Quezaltepeque, 23 Aug. 1961, 2 ♂, 3—16 July 1963, 1 ♂, 6 Aug. 1963; Usulután, 2 ♀ and 7 ♂, 12 July 1963, D. Cavagnaro and M. E. Irwin (UCD).

Guatemala: 1 ♂, paratype, Guazacapán, 11 Aug. 1952, R. H. Painter (CU).

Costa Rica: 1 ♂, paratype, Liberia, Guanacasta Prov., 6 Aug. 1964, G. E. Eickwort (KU).

Mexico: Chiapas: 1 ♀, 20 mi south Tuxtla Gutiérrez, 12 Aug. 1963, F. D. Parker and L. A. Stange (UCD); 1 ♂, 35 mi west Tuxtla Gutiérrez, 16 Aug. 1972, G. F. and S. Hevel (USNM). Guerrero: 1 ♂, Almolongo, 6000 ft, 29 July 1962, H. E. Evans; 1 ♂, 10 km east Chilpancingo, 5200 ft, 30 July 1962, H. E. Evans (MCZ); 1 ♂, 5 mi south, 2.5 mi east Chilpancingo, 3800 ft, 5 Aug. 1962, University Kansas Mex. Exped. (KU); 1 ♀, 33 mi north Taxco, 5700 ft, 29 Aug. 1963, Scullen and Bolinger (OSU). Jalisco: 1 ♀, 8 mi southwest San Juan de Los Lagos, 4 Aug. 1954, J. W. McSwain; 1 ♀ and 3 ♂, Guadalajara, Crawford (UCD); 1 ♀ and 3 ♂, Guadalajara, 17—28 July 1965, H. E. Evans, 1 ♂, 9 mi south Guadalajara, 24 July 1965, H. E. Evans (MCZ). Morelos: 1 ♀, Yautepec, 31 July 1963, F. D. Parker and L. A. Stange (UCD). Oaxaca: 2 ♀, Temaxcal, 21 Sept. 1963, K. H. Janzen and 16 July 1966, J. S. Buckett, M. R. and R. C. Gardner (UCD). Sinaloa: 1 ♂, Mazatlán, 15—20 Aug. 1962, H. E. Evans; 2 ♂, Villa Union, 17 Aug. 1962, H. E. Evans (MCZ). Yucatán: 1 ♀, Chichén Itzá, 29 June (MCZ). All paratypes.

The last mentioned female is accompanied by a mature Homopteron and a handwritten note "apparently an undescribed genus and species in the subfam. Jassinae". The hind basitarsi of this female are pale brown with dark brown base, the bases of the following segments are very pale brown.

One of the females from Mexico (Morelos) has a distinctly golden pubescent

face, in another female from Mexico (Guerrero, 33 mi north of Taxco) the face is pale golden.

The mesopleura of the female of *P. punctatellus* are notably finely and regularly punctate. It very much resembles the female of *P. spangleri*, which, however, is distinguished by the somewhat stronger punctation of the mesopleura, the yellowish-white outer side of the mid tibiae and the whitish hind tarsi. The males of *P. punctatellus* and of *P. spangleri* have strongly different tyloidea.

The males of *P. punctatellus* from Mexico have more shining mesopleura than the males from El Salvador and the scutum is not rugose.

The specific name refers to the minute punctures of the mesopleura.

Pluto depressus sp. nov.

Male. — Length about 4—6 mm. Black. Mandibles yellow with reddish tips. Underside of flagellum brownish-yellow. Pronotal tubercles whitish. Tegulae yellowish-brown. Fore and mid tibiae reddish-yellow, tarsi whitish, last segment brown. Basal 1/3 of hind tibiae yellowish-white, tarsi brown with paler tips of segments. Veins of wings dark brown.

Median part of clypeal margin indistinctly protruding, indistinctly bidentate. Frons shining, distinctly punctate, somewhat raised around anterior ocellus. Vertex shining, sparsely finely punctate. Intercarinal space narrow. POD somewhat larger than OOD. Antennae slender, most segments over 1.5 times as long as broad, last segment over twice as long as broad, segments 4—7 with narrow tyloides, nearly as long as segments, segment 8 with much shorter tyloides, sometimes segment 9 with small shining point.

Pronotum in dorsal view with oblique lateral angles. Scutum shining, strongly punctate, medially distinctly longitudinally depressed, hind margin of scutum strongly triangularly depressed. Scutellum sparsely punctate. Propodeal enclosure shining, irregularly carinate. Back of propodeum dull, finely and closely reticulato-carinate, with parallel dorso-lateral carinae. Mesopleura shining, with strong separate punctures, Hypo-epimeral area shining, finely punctate, interstices about size of punctures. Mesosternum densely finely punctate. Anterior plate of mesepisternum dull, closely punctate. Gaster slender, petiole about as long as first tergite, this tergite over twice as long as broad. Second recurrent vein of fore wings interstitial.

Pubescence of face and tempora silvery, mostly appressed. Rest of body whitish pubescent, hairs long on vertex, pronotal collar and pronotal tubercles.

Female unknown.

Mexico: 6 ♂, holotype and paratypes, Sinaloa, Villa Union, 17 Aug. 1962, H. E. Evans (MCZ).

P. depressus seems to be very close to *P. sayi* and *P. abbreviatus*, all having a very finely reticulate propodeum. The number of tyloidea is reduced as compared with these two species, but they are not considerably shorter than the segments as in *P. abbreviatus*.

The specific name refers to the median and posterior depressions of the scutum.

Pluto abbreviatus sp. nov.

Female. — Length about 5—5.5 mm. Head and thorax black. Mandibles reddish. Labrum dark reddish. Underside of antennae yellowish-red. Pronotal tubercles and tegulae yellowish-white. Fore and mid tibiae and tarsal segments 1—4 yellowish-white, underside of tibiae dark brown. Basal third of hind tibiae yellowish-white, tarsi except for apices brown. Petiole and greater part of first tergite black, hind margin of first tergite, all of tergites 2—6 and sternites 2—6 red. Veins of wings dark brown.

Median third of clypeal margin straight, indistinct lateral angles. Frons densely finely punctate, low lateral tubercles shining, much less densely punctate. Vertex finely reticulate alutaceous, sparsely finely punctate. POD about 1.5 times OOD. Intercarinal space narrow. Antennae short, clavate, segments 10—11 shorter than broad.

Lateral pronotal angles obtuse. Scutum and scutellum finely reticulate alutaceous, sparsely punctate. Anterior plate of mesepisternum dull. Enclosed area of propodeum shining, back dull, finely reticulato-carinate, dorso-laterally finely obliquely striate. Hypo-epimeral area dull, indistinctly superficially punctate. Mesopleura dull, finely reticulate alutaceous, finely punctate, interstices partly larger than punctures. Mesosternum densely very finely punctate. Petiole about 2/3 length of first tergite, this tergite somewhat longer than broad. Pygidial area about twice as long as broad. Second recurrent vein ending in third submarginal cell.

Pubescence silvery-white, on face mostly appressed; hairs on pygidial area dark brown.

Male. — Length 5 mm. Pronotal tubercles yellowish-white. Fore and mid tibiae largely dark brown, narrow yellowish-white streak on outer side. Hind tarsi when viewed from behind very pale brown. Hind margin of first tergite, all of tergites 2—3 and greater part of sternites 2—3 red.

Antennae long and slender, segments about 1.5 times as long as broad, segments 5—13 with tyloides, short on segment 5, linear and nearly as long as segment on segments 6—7 or 6—8, narrow oval and about half as long as segment on segments 8—12 or 9—12, an indistinct tyloides on segment 13, which segment is over twice as long as broad.

Scutum somewhat shining, densely punctate, interstices as large as punctures or smaller. Punctation of mesopleura stronger than in female. Back of propodeum finely reticulate. Petiole about 2/3 length of first tergite, this tergite over 1.5 times as long as broad. Gaster slender.

Mexico, Baja California: 1 ♀ holotype and 1 ♂, allotype, 10 mi northwest La Paz, 6 Oct. 1941, Ross and Bohart; 1 ♀, paratype, San Pedro, 7 Oct. 1941, Ross and Bohart (CAS); 1 ♂, paratype, Vircaino Desert, 10 Oct. 1959, F. E. Strong (UCD). A ♂, collected together with the paratype (CAS) is considered to belong to this species, but it is coloured like *P. basifuscus*, i.e. the gaster is almost entirely black; the hind tarsal segments 1—4, except for the base of the basitarsus, are whitish.

P. abbreviatus is close to *P. sayi* as well as to *P. basifuscus*. The male is easily recognized by the elongate tyloidea, most of which are considerably shorter than the antennal segments. The female has an almost entirely red gaster. The extension of the red colour may be reduced, however, and further studies are needed. The punctation of the hypo-epimeral area is indistinct, as opposed to *P. sayi* and *P. basifuscus*. The petiole is somewhat shorter than in *P. basifuscus*.

The specific name refers to the abbreviated tyloidea on the last antennal segments of the male.

Group of *aerofacies*

Pluto aerofacies (Malloch)
(fig. 16)

Malloch, 1933: 49, ♀ and ♂ (*Psenia aerofacies*; Texas; Mexico).
Krombein, 1951: 962 (*Pluto aerofacies*, comb. nov.).
Bohart & Menke, 1976: 171.

Female. — Length about 7 mm. Head and thorax black; labrum and mandibles dark reddish, underside of flagellum orange-brown. Pronotal tubercles whitish, tegulae reddish, veins of wings brown. Fore and mid tibiae reddish, base and outer side somewhat yellowish, underside more or less brownish, fore and mid tarsi reddish, first two segments whitish. Basal third of hind tibiae and tarsal segments 1—4 yellowish-white. Gaster black, hind margins of tergites and apex of last segment somewhat reddish transparent.

Slightly roundly protruding median part of clypeal margin about half total width of margin, straight, laterally indistinctly defined. Frons between ocelli and antennae dull, densely punctate, sides of frons shining. Vertex and interocellar area reticulate alutaceous, sparsely punctate. Occipital carina complete, intercarinal space narrower than first basitarsus. Antennae clavate, segments 10—11 somewhat shorter than broad.

Lateral pronotal angles rectangular. Scutum shining, rather strongly irregularly punctate, interstices on lateral parts a few times size of punctures. Scutellum shining, sparsely punctate, posterior margin somewhat rugose. Propodeal enclosure deep and shining, large median area. Back of propodeum dull, coriaceous, coarsely reticulato-carinate. Mesopleura dull, reticulate alutaceous, median part rather coarsely striato-punctate, finer punctate just below hypo-epimeral area and on lower half of mesopleura, interstices larger than punctures. Mesosternum finely punctate. Hypo-epimeral area dull, densely finely punctate. Anterior plate of mesepisternum dull, obliquely rugose, rugae continuing into broad oblique suture. Petiole about 2/3 length of first tergite, this tergite longer than broad. Pygidial area slightly over twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Face pale golden, mostly appressed pubescent. Hairs on vertex and on dorsal side of thorax greyish-brown, pygidial area dark golden-brown appressed pubescent, remainder of body with whitish or greyish hairs.

Male. — Length about 6—7 mm. Similar to female. Hind tarsal segments 2—4 basally somewhat infuscated. Vertex finely transversely striate. Antennal segments 11—12 longer than broad; segments 4—12 with reddish linear tyloides. Median part of clypeal margin less than 1/3 of total width of margin (fig. 16).

Scutum transversely rugoso-punctate. Mesopleura somewhat stronger sculptured, upper part rugoso-punctate, punctures on lower part also mostly in rows, interstices between rows partly size of punctures, partly absent. Mesosternum with finer, separate punctures. Back of propodeum very coarsely reticulato-carinate. Petiole about as long as first tergite, this tergite about 1.5 times as long as broad. Pubescence of face silvery.

Materal examined: 1 ♂, allotype, Victoria, Texas, 8 July 1907, on *Acacia* sp., J. D. Mitchell; 1 ♂, paratype, No. 1785, Mexico, C. F. Baker (USNM, type No. 44219).

New records from Texas: 1 ♀, Brownsville, 3 May 1904 (USNM); 1 ♂, Brownsville, 20—30 June 1965, H. E. Evans (MCZ); 1 ♀, Victoria, 21 July 1911, on *L. natans*, J. D. Mitchell; 1 ♂, Waco, 8 June 1948, on CSC weeds, P. A. Glick (USNM); 2 ♂, Hidalgo, 17 July 1954, J. G. Chillcott (CNC); 1 ♂, 10 mi south Kerrville, 22 June 1942, E. S. Ross (CAS).

First record from North Carolina: 1 ♀, Person Co., 19 Aug. 1964, H. D. Blocker (NCSU).

New records from Mexico: Campeche: 1 ♀, 20 mi east Hopelchén, 10 ft, 16 Aug. 1963, Scullen and Bolinger (OSU). San Luis Potosí: 1 ♀, 3.4 mi northeast El Naranjo, 800 ft, 5 Sept. 1962, Univ. Kansas Mex. Exped. (KU). Tabasco: 1 ♀, Teapa, Febr., H. H. Smith (BM). Veracruz: 1 ♂, 2 mi south Pánuco, 14 Aug. 1959, L. A. Stange and A. S. Menke (UCD). Yucatan: 1 ♂, Quintana Roo (Territorio), 12 mi east Peto, 29 June 1966, Univ. Kansas Mex. Exped. (KU). The males from Mexico have the lower part of the mesopleura closely striato-punctate, with very small or no interstices.

First record from Belize (British Honduras): 1 ♂, Belize (UCD).

The female of *P. aerofacies* is easily recognized by the pale golden face, the coarsely sculptured back of the propodeum and the length of the petiole, the male by the striato-punctate mesopleura, the length of the petiole and the pale hind tarsi. The male of *P. tibialis*, with which Malloch (1933) compared his male of *aerofacies*, has no distinct striae or rugae on the mseopleura, although the punctures are partly placed in rows.

Pluto evansi sp. nov.
(fig. 17)

Female. — Length about 5.5 mm. Black. Mandibles, labrum and underside of flagellum reddish-brown. Pronotal tubercles yellowish-white. Foreside of fore tibiae and last tarsal segments orange-brown, underside of fore tibiae with brownish streak, tarsal segments 1—3 of fore and mid legs whitish, mid and hind tibiae

dark brown, bases yellowish-brown, hind tarsi except for last segment yellowish-white, base of basitarsus brown, bases of segments 3—4 more or less darkened. Tegulae brown, veins of wings dark brown.

Median part of clypeal margin slightly but distinctly emarginate, less than half total width of margin, lateral angles little protruding (fig. 17). Disk densely punctate, before margin somewhat shining and coarser punctate, narrow fore margin slightly depressed. Median part of frons densely finely punctate, laterally with interstices about size of punctures. Vertex slightly or indistinctly alutaceous, punctate, interstices a few times size of punctures. Frons somewhat raised, a depression on outer side of posterior ocelli. Occipital carina complete, intercarinal space narrower than fore basitarsus. Antennae short, clavate, segments 9—11 shorter than broad.

Lateral pronotal angles about rectangular. Scutum finely reticulate alutaceous, punctate, interstices a few times size of punctures. Scutellum with same micro-sculpture, sparsely punctate. Metanotum densely punctate. Propodeal enclosure shining, large median area, back of propodeum somewhat dull, coarsely reticulato-carinate. Mesopleura and mesosternum finely reticulate alutaceous, finely punctate, interstices a few times size of punctures. Hypo-epimeral area somewhat shining, very finely, almost indistinctly punctate, interstices larger than punctures. Anterior plate of mesepisternum dull, oblique suture crenulate, carinae continued on anterior plate. Petiole slightly over half as long as first tergite, this tergite longer than broad. Pygidial area over 1.5 times as long as broad. Second recurrent vein of fore wings interstitial.

Pubescence of face and pronotal collar silvery, mostly appressed, of pygidial area brown, of rest of body whitish or greyish.

Male. — Similar to female. Length about 5 mm. Fore and mid tibiae entirely yellowish-brown. Hind tarsal segments 1—2 whitish, base of basitarsus and segments 3—5 pale yellowish-brown.

Clypeal margin straight. Antennal segments about 1.5 times as long as broad, segments 6—11 with fine linear tyloides, of same pale colour as underside of flagellum, an indistinct tyloides on segment 5. Posterior 2/3 of scutum almost smooth, punctation as in female. Gaster slender, petiole about 3/4 length of first tergite, this tergite over 1.5 times as long as broad.

Mexico: Sonora: 1 ♀, holotype, and 1 ♂, allotype, 10 mi southeast Alamos, 29 June 1963, F. D. Parker and L. A. Stange (UCD). Sinaloa: 1 ♀, paratype, Chupaderos, 4 July 1963, F. D. Parker and L. A. Stange (UCD). Morelos: 1 ♀, paratype, Huajintlan, 2800 ft, 28 May 1959, H. E. Evans (CU).

Pluto emarginatus sp. nov.
(fig. 18)

Female. — Length about 7 mm. Black. Mandibles and underside of flagellum reddish-brown. Pronotal tubercles and tegulae brown. Veins of wings dark brown. Foreside of fore tibiae yellowish-brown, fore and mid tarsi and base of hind tibiae pale yellowish-brown. Hind tarsi brown, apices of segments paler.

Anterior margin of clypeus (fig. 18) emarginate, with distinct triangular lateral teeth, distance between teeth about half total width of margin. Frons densely finely punctate, raised lateral parts sparsely punctate. Vertex sparsely punctate. POD wider than OOD. Intercarinal space about half width fore basitarsus. Antennal segments 9—11 shorter than broad.

Lateral pronotal angles about rectangular. Scutum very finely reticulate alutacous, punctate, interstices mostly a few times size of punctures. Scutellum with same sculpture, sparsely punctate. Back of propodeum coarsely reticulato-carinate, carinae oblique on dorso-lateral parts; propodeal enclosure shining, large median area. Mesopleura, hypo-epimeral area and mesosternum slightly alutaceous. Mesopleura sparsely finely punctate, hind margin finely rugulose. Hypo-epimeral area very finely punctate, interstices wider than punctures. Anterior plate of mesepisternum dull, oblique suture crenulate. Petiole about 2/3 length of first tergite, this tergite about 1.5 times as long as broad. Pygidial area about twice as long as broad. Second recurrent vein of fore wings interstitial.

Face and pronotal collar silvery, mostly appressed, pubescent. Pubescence of pygidial area dark golden-brown, of rest of body greyish or whitish. Male unknown.

Mexico: 1 ♀, holotype, 6 mi south Temixco, Morelos, 16 July 1963, F. D. Parker and L. A. Stange (UCD).

P. emarginatus is distinguished by the distinctly emarginate clypeal margin and the almost shining, sparsely but distinctly punctate mesopleura. It seems to be closely related to *P. evansi*, which has a slightly emarginate clypeal margin, but in this latter species the petiole is somewhat shorter and the pronotal tubercles and hind tarsi are whitish.

The specific name refers to the emargination of the clypeal margin.

Group of *rufibasis*

Pluto rufibasis (Malloch)
(figs. 19—21)

Malloch, 1933: 53, ♀ and ♂ (*Psenia rufibasis*; Georgia), 54, ♀ and ♂ (*Psenia marginata*; Louisiana, South Carolina).

Krombein, 1951: 962 (*Pluto rufibasis*, comb. nov.), 962 (*Pluto marginatus*, comb. nov.); 1964: 18 (*Pluto rufibasis*; Florida).

Bohart & Menke, 1976: 171 (*Pluto marginatus*), 171 (*Pluto rufibasis*).

Van Lith, 1976: 154—158 (*Pluto rufibasis*; *Pluto marginatus* syn. nov. of *rufibasis*).

For the redescription of *P. rufibasis* cf. Van Lith (1976). Clypeal margin of female: fig. 19.

One of the paratype males (*marginata* Malloch) from Louisiana is only 6 mm long, another male from this state has a length of 7 mm, the male from Mississippi is not longer than 5.5 mm. Their normal length is 8—9 mm. Genitalia: figs. 20—21.

Material examined: 1 ♂, allotype *Psenia rufibasis* Malloch, Tifton, Georgia,

Ashmead (USNM, type No. 44224). *Psenia marginata* Malloch: 1 ♂, allotype and 5 ♂, paratypes, Louisiana, 2336, 2337 and 2392, C. F. Baker; 1 ♀ and 1 ♂, Opelousas, Louisiana, G. R. Pilate; 1 ♂, paratype, Buckfield Plantation, Yemassee, South Carolina, 1 Oct. 1926, J. T. Rogers (USNM, type No. 44225).

New records from USA: Florida: Lake Placid, 2 ♀, 20—26 Juni 1962, K. V. Krombein (USNM), 3 ♀ and 5 ♂, May 1967, G. Heinrich (HT); Archbold Biological Station, Highlands Co., 3 ♀ and 1 ♂, 13—14 Oct. 1964, P. H. Arnaud, Jr. (CAS); Fort Myers, Lee Co., 3 ♂, 5—20 May 1967, 1 ♀ and 6 ♂, 19—25 April 1971, P. P. Babiy (ZSM); Weeki Wachi Springs, Hernando Co., 1 ♂, 16 Aug. 1968, G. F. Hevel (USNM); Tall Timbers, 1 ♀ and 2 ♂, 12 June—11 July 1971, R. H. Arnett (HT). Louisiana: 2 ♀ and 11 ♂, Rapides Parish, 18 May—19 June 1973, Peter Rush (HT). Maryland: Calvert Co., 1 ♀, 17 Aug. 1949, D. G. Shappirio (USNM). Mississippi: Utica, 1 ♂, Ashmead (USNM). North Carolina: Wake Co., 1 ♂, 6 Sept. 1951, H. and M. Townes (HT); Cumberland Co., Fort Bragg, 3 ♀ and 1 ♂, 6—13 June, 16—25 Aug., 17—20 Sept. 1967, J. D. Birchim (CAS). South Carolina: Greenville, 1 ♀, 7 June 1952, G. and L. Townes (HT); Seneca, 1 ♀, 15 June 1961, W. H. Anderson (USNM). Virginia: Montgomery Co., Westmoreland, 2 ♀, 29 Aug. 1954, D. G. Shappirio (USNM).

The study of this material has confirmed my opinion (Van Lith, 1976) that *rufibasis* and *marginatus* are conspecific, the species showing great tendency to erythrization in the southern parts of Florida and in Georgia. The females from Lake Placid, Highland Co. and the greater part of the specimens from Fort Myers are largely red. The rest of the material from Fort Myers, the male from Mississippi and the females from North and South Carolina, Virginia and Maryland have a dark petiole and more or less darkened tergites and femora.

Group of *albifacies*

Pluto albifacies (Malloch)
(fig. 22)

Malloch, 1933: 50, ♀ (*Psenia albifacies*; Iowa).
Krombein, 1951: 962 (*Pluto albifacies*, comb. nov.); 1967: 396 (Texas).
Evans, 1959: 140—141 (*Pluto albifacies*?, larvae; Texas); 1968: 1343—1344 (*Pluto albifacies*; prey).
Bohart & Menke, 1976: 171.

Female. — Length about 6.5 mm (8 mm according to Malloch). Black. Mandibles yellowish-red, labrum dark reddish. Underside of flagellum orange-red. Anterior margin of clypeus dark reddish transparent. Fore and mid tibiae yellowish-red, outer side whitish, tarsi whitish, last segment yellowish-red. Basal third of hind tibiae and tarsal segments 1—4 yellowish-white, segment 5 brown. Pronotal tubercles whitish. Tegulae yellowish or reddish. Hind margins of tergites reddish transparent, sides of tergites 2—3 and all of sternites 2—3 sometimes reddish or reddish-brown. Veins of wings dark brown.

Median part of clypeal margin straight, over 1/3 of total width of margin, laterally with obtuse angle (fig. 22). Disk of clypeus dull, densely punctate. Frons

densely punctate, laterally with distinct almost impunctate tubercle. Vertex finely reticulate alutaceous, sparsely finely punctate. POD about as large as OOD. Occipital carina complete, latero-ventrally with thickening or angle; intercarinal space about half width of first basitarsus.

Lateral pronotal angles rectangular. Scutum dull, reticulate alutaceous, punctate, interstices on central part larger than punctures. Scutellum dull, anterior half sparsely punctate, hind margin densely punctate. Propodeum dull, back finely reticulato-carinate, dorso-laterally with fine parallel, oblique carinae; median part of enclosure somewhat shining, usually irregularly carinate. Mesopleura dull or faintly shining, finely punctate, interstices size of punctures or less. Mesosternum very finely densely punctate. Hypo-epimeral area dull, densely finely, almost indistinctly punctate. Anterior plate of mesepisternum dull, oblique suture crenulate. Petiole nearly as long as tergite 1, this tergite somewhat longer than broad. Pygidial area about twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Face densely silvery appressed pubescent, also some long erect hairs. Pubescence of vertex and dorsal side of thorax greyish, of pygidial area dark golden-brown, of rest of body whitish, dense on back and sides of thorax.

First description of male. — Length about 5 mm. Colour as in female. Antennae slender, segments about 1.5 times as long as broad, segments 4—12 with black linear tyloides, short on segment 12. Underside of flagellum yellowish-red.

Punctation of scutum rather dense, interstices mostly smaller than punctures, punctures partly in rows. Lower 2/3 of mesopleura closely finely punctate, on upper part a few interstices larger than punctures. Hypo-epimeral area finely but distinctly densely punctate. Back of propodeum as in female. Petiole as long as first tergite, this tergite about 1.5 times as long as broad. Pubescence of face very silvery.

I have not seen the type (female) from Sioux City, Iowa, which was captured by C. N. Ainslie on 13 July, 1929 (USNM, type No. 44220), but I could examine a series of other specimens from Iowa, also collected by Ainslie: Sioux City, 12 ♀ and 3 ♂, July-Aug. 1925, 1926, 1927, 1928, 1931—1934, three of these females without date; 1 ♀ and 1 ♂, Sergeant Bluff, 10 July and 3 Aug. 1933 (USNM).

In addition I could study a female from Texas, Red River, Wilbarger Co., 4 Juli 1956, Biol. note No. 1184 (USNM). This is apparently one of the two adult specimens from the nests containing the larvae described by H. E. Evans (1959: 140—141; total of females in this colony at least 200). In 1968 Evans presented more details regarding the same nests and he also stated that their food consisted of leafhoppers all belonging to the Cicadellid *Opsius stactogalus* Fieber. About 1/3 of the 50 examples were nymphs.

Group of *tibialis*

Pluto tibialis (Cresson)

Cresson, 1872: 227, ♀ and ♂ (*Mimesa tibialis*; Texas); 1916: 102, ♀ (Amer. Ent. Soc. type No. 2048).

Dalla Torre, 1897: 355.
Fox, 1898b: 18, ♀ (*Psen tibialis*; District of Columbia).
Ashmead, 1899: 225.
Viereck, 1901: 342, ♀ and ♂ (*Neofoxia tibialis*).
Malloch, 1933: 49 (*Psenia tibialis*; Texas, District of Columbia, Louisiana).
Krombein, 1951: 962 (*Pluto tibialis* comb. nov.; District of Columbia, Virginia, Tennessee, Louisiana, Missouri, Texas); 1967: 396 (Alabama, South Carolina).
Bohart & Menke, 1976: 171.

Female. — Length 6—7.5 mm. Head and thorax black. Mandibles reddish; underside of flagellum orange-brown. Pronotal tubercles whitish. Tegulae whitish or reddish, veins of wings dark brown. Fore and mid tibiae and last tarsal segments reddish or reddish-brown, outer side of tibiae and tarsal segments 1—3 or 1—4 yellowish-white. Basal third of hind tibiae and tarsal segments 1—4 yellowish-white, last tarsal segment brown. Gaster black, hind margins of tergites and last segment reddish.

Apex of clypeus straight, median part less than half total width of margin, laterally with indistinct teeth (cf. fig. 24. *arenivagus*). Central part of frons densely punctate, vertex finely reticulate alutaceous, sparsely punctate, back of head also finely transversely striate. POD larger than OOD. Occipital carina complete, intercarinal space linear. Antennae somewhat clavate, segments 10—11 about quadrate.

Lateral pronotal angles rectangular. Scutum shining, strongly punctate, interstices often larger than punctures, also some very small punctures. Scutellum shining, sparsely punctate, hind margin rugoso-punctate. Propodeal enclosure medially irregularly reticulate, laterally some oblique carinae. Back of propodeum dull, irregularly but not coarsely reticulato-carinate, with some fine oblique dorso-lateral carinae. Hypo-epimeral area dull, longitudinally striato-punctate, striae on lower part indistinct. Mesopleura dull, reticulate alutaceous, upper half moderately strongly, partly coarsely punctate, somewhat longitudinally striate, lower part with finer punctures in rows but no distinct striae, interstices about size of punctures; hind margin finely rugulose. Mesosternum densely finely punctate. Anterior plate of mesepisternum vertically striate, oblique suture crenulate. Petiole about half as long as first tergite, this tergite somewhat longer than broad. Pygidial area about 2.5 times as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Face with silvery appressed pubescence and long erect hairs. Vertex and dorsal side of thorax greyish-brown pubescent, pubescence of pygidial area very dark brown, of rest of body greyish-white.

Male. — Length 6—6.5 mm. Colour as in female. Antennae slender, segments longer than broad; segments 5—10 with linear black tyloidea, on segment 10 often shorter than segment, sometimes also a short tyloides on segments 4 and 11. Vertex densely punctate, scutum strongly punctate, interstices mostly smaller than punctures. Back of propodeum coarsely reticulato-carinate. Mesopleura stronger and very closely punctate, punctation regular, sometimes on upper and/or lower part interstices larger than punctures, no distinct rugae or striae, hind margin coarsely rugulose. Hypo-epimeral area coarsely rugoso-punctate. Petiole about

2/3 or 3/4 length of first tergite, this tergite about 1.5 times as long as broad.

Material examined: Texas: 1 ♂, Belfridge (USNM, type No. 1718; no antennae); 1 ♀, Paris, 26 Aug. 1905, F. C. Bishopp; 1 ♀, New Braunfels, 17 May 1906, J. C. Crawford; 1 ♀, Plano, July 1907, catfield, E. S. Tucker, "*Neofoxia tibialis*" (USNM). Louisiana: 1 ♀, No. 2337, "compared with holotype of *Mimesa tibialis* Cr. at ANSP (Academy of Natural Sciences, Philadelphia) 1950, K. V. Krombein", 3 ♀ and 9 ♂, Nos. 2236, 2335, 2336, 2392, 2524, 2525, 2565, 2566, C. F. Baker; 2 ♀ and 3 ♂, Opelousas, Pilate (USNM). Virginia: 1 ♀, Clifton, 30 June 1935, K.V. Krombein (KVK). Alabama: 2 ♀ and 1 ♂, Montgomery, 23 June, K. V. Krombein (KVK). District of Columbia: 1 ♂, 20 July 1879, 349, T. Pergande, "*Mimesa tibialis* Cress., Cress. 80"; this is probably the male to which Malloch (1933) refers when he writes: "the District of Columbia male lacks a sensory area on the apical three flagellar segments". In his description of the male Malloch states that the tyloidea are present on all but the apical and basal two segments of the flagellum and that there is some variation in the presence or absence on the penultimate segment. Unfortunately the abovementioned type from Texas has no antennae.

New records from Texas: Fodor, 1 ♀ and 1 ♂, 17 May 1898, Birkmann, "*tibialis* Cr. det. Kohl" (NMW); Waco, 2 ♀ and 5 ♂, 16 June and 13 July 1948, 29 June 1949, on bluestem grass and on cotton, P. A. Glick. Louisiana: 1 ♀, Tallulah, 1 July 1948, Bug Catcher Exp., R. C. Gaines (USNM).

First records from Florida: 1 ♀, Fort Myers, 16 April 1971, P. P. Babiy (BSM). Missouri: 2 ♂, 14 June and 17 July, Columbia, 4 pm — 7 am, Malaise trap, F. D. Parker. South Carolina: 1 ♂, Seneca, 25 July 1962, on pine tree, R. D. Eikenbary. Tennessee: 1 ♂, Cedar Glade Area, Mid Tennessee, 31 May, Adelphia Meyer, "*Psen tibialis* (Cress.) det. Sandhouse" (USNM); 2 ♀ and 6 ♂, Madison, Davidson Co., 10 June—22 July 1967, P. P. Babiy (BSM). Virginia: 1 ♂, Clifton, 15—23 July 1933, J. C. Bridwell (USNM).

The records from Nebraska (Mickel 1918) seem to be doubtful and have apparently not been accepted by Malloch (1933).

Pluto arenivagus arenivagus Krombein
(figs. 23—25)

Malloch, 1933: 48 and 58, ♀ (*Psenia angulicornis* var.; Georgia).
Krombein, 1949: 268—269, ♀ and ♂ (*Pluto arenivagus*; North Carolina, Georgia); 1951: 962; 1953: 132 (North Carolina); 1954: 233 (Florida); 1958: 189 (Florida).
Bohart & Menke, 1976: 171.

Both sexes are characterized by the ventral part of the occipital carina and the hypostomal carina being almost contiguous (fig. 23). The original description (Krombein, 1949) can be supplemented with the following details. Clypeal margin: fig. 24. Mesopleura densely and strongly punctate, in female partly striato-punctate. Petiole about 3/4 length of first tergite. In female at least tergite 2 entirely red; gaster of male black with reddish hind margins of segments, rarely also bases of tergites 2—3. Tarsi whitish to yellowish, last segment of fore and mid

tarsi yellowish-red, of hind tarsi brown. Second recurrent vein of fore wings ending in third submarginal cell. Pygidial area of female: fig. 25.

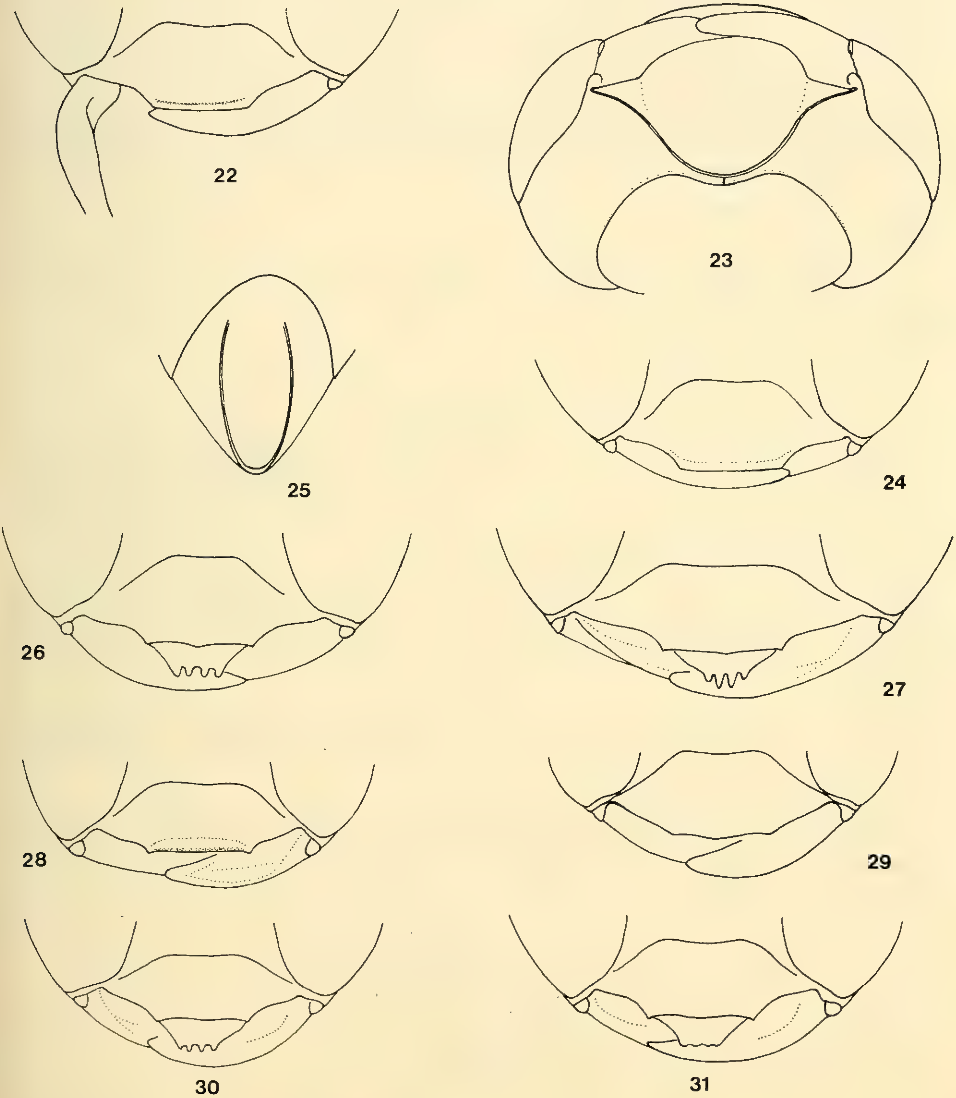


Fig. 22. *Pluto albifacies* (Malloch), ♀, clypeus. Figs. 23—25. *P. arenivagus arenivagus* Krombein, ♀, paratype; 23, head in ventral aspect; 24, clypeus; 25, pygidial area. Figs. 26—31. Clypeus; 26, of *P. argentifrons* (Cresson), ♀, Cuba; 27, *P. atricornis* (Malloch), ♀, St. Croix; 28, *P. colonensis* sp. n., ♀, holotype; 29, *P. alphitopus* sp. n., ♀, holotype; 30, *P. stramineipes* sp. n., ♀, holotype; 31, *P. strigellus* sp. n., ♀, holotype.

Material examined: 1 ♂, holotype, Kill Devil Hills, North Carolina, 28 May 1948, K. V. Krombein (USNM, type No. 14058); 1 ♀ and 1 ♂, paratypes, same locality, 30 May and 27 May 1948; 5 ♀, same locality, 30 May—5 Aug. 1950—1958, K. V. Krombein (KVK); 1 ♀, paratype, Tifton, Georgia, Ashmead collection, labelled "*angulicornis* var., paratype No. 44229" (USNM, paratype No. 59312); 1 ♀, Venus, Highlands Co., Florida, 17 April 1963, K. V. Krombein (USNM).

New records from Florida: 1 ♂, Oneco, 29 March 1955, J. C. Martin (CNC); 2 ♂, Fort Myers, Lee Co., 28 April and 3 May 1967, 1 ♀ and 1 ♂, Fort Myers, 17 April 1971, P. P. Babiy (BSM); 1 ♀, St. Joseph St. Park, Gulf Co., 1—3 May 1970, W. W. Wirth (USNM); 1 ♀, Big Pine Key, Monroe Co., 23 June 1971, W. H. Pierce (FSC).

P. arenivagus is closely related to *P. tibialis*, but the male is distinguished by the presence of tyloides also on the antennal segments 11—12, the female by the reddish second gastral tergite.

Pluto arenivagus cubanus subsp. nov.

Female. — Very similar to nominate subspecies. Fore and mid tibiae darker, underside of fore tibiae brown, mid tibiae dark brown, apices and outer side yellowish-white. Hind margin of first tergite, second tergite except for large basal brown mark, third tergite and sternites 2—4 red.

Punctation of scutum finer, interstices wider, mostly twice size of punctures. Punctation of mesopleura somewhat coarser. Hypo-epimeral area distinctly longitudinally striato-punctate. Back of propodeum more coarsely reticulate. Male unknown.

Cuba: 1 ♀, holotype, Mantua, Prov. Pinar del Rio, June 1968, P. Alayo (UCD). This is apparently one of the specimens recorded as "*Pluto* Sp. A" by P. Alayo Dalmau (1973).

The differences between the holotype of *cubanus* and the continental form are small. Further studies are needed to determine whether these differences are constant.

Group of *argentifrons*

Pluto argentifrons (Cresson)
(fig. 26)

Cresson, 1865: 152, ♀ and ♂ (*Psen argentifrons*; Cuba).
Dalla Torre, 1897: 347 (*Psen argentifrons*; Cuba).
Ashmead, 1900: 305 (Cuba, Jamaica).
Cresson, 1916: 102 (Cuba).
Pate, 1946: 6—9 (*Pluto argentifrons*, comb. nov.; Cuba).
Alayo, 1973: 181 (Cuba, abundant).
Bohart & Menke, 1976: 171 (Cuba).

Pate (1946) furnished a detailed redescription. The following supplementary remarks can be made. Intercarinal space less broad than first basitarsus. The back of the head and the tempora are finely striate, the mesopleura of the female very closely very finely punctate, anteriorly somewhat striato-punctate; in the male the mesopleura are finely ruguloso-punctate. The second recurrent vein of the fore wings ends in the third submarginal cell. Clypeal margin: fig. 26.

Malloch (1933) apparently confused *P. argentifrons* and *P. atricornis* (Malloch) and he omitted to mention the former species. The authorities of the National Museum of Natural History, Washington, D. C., kindly enabled me to examine the two females from Cuba, incorrectly described by him as the female of *P. atricornis* Malloch, 1933.

Pate (1946) suspected that the specimens reported by Ashmead from Jamaica would be found to belong to another species, but I could not find any substantial differences between the material from Cuba and the specimens from Jamaica.

Material examined: Cuba: 1 ♀, Baraguá, 2 Dec. 1925, T.P.R.F., Ent. No. 346, at light, C. F. Stahl; 1 ♀, Santiago de las Vegas, 21 June 1917, C. 19, P. Cardin, labelled "*Mimesa argentifrons* Cress., det Roh.", both specimens misidentified by Malloch as the female of *P. atricornis* from Puerto Rico (USNM, type No. 44228, allotype and paratype). Jamaica: 1 ♂, Portland, labelled "*Neofoxia argentifrons* Cress., Roh." (USNM); 1 ♂, Placetas to Remedios, Sta. Clara, 20 July 1940, J. C. Bradley (CU).

New records from Cuba: 1 ♀, Baraguá, 14 Sept. 1925, T.P.R.F. Ent. No. 346, on grasses, C. F. Stahl, 1 ♂, Baraguá, 2 Dec. 1925, T.P.R.F. No. 344, taken on legumes, C. F. Stahl (MCZ); 2 ♀, Cabanas, Pinar del Rio, 5—8 Sept. 1913 (AMNH); 1 ♂ N. Banks; 1 ♂, Central Soledad, Cienfuegos, 19 Aug. 1932, B. B. Leavitt; 2 ♂, Soledad, 192. and 1925; 2 ♂, Soledad, Santa Clara Prov., 7—12 June 1939, C. T. Parsons; 2 ♂, Botanical Gardens, Central Soledad, Cienfuegos, 17 Aug. 1930, Richard Dow, with label "*Psen (Psen) argentifrons*"; 1 ♀, Belmonte, Central Soledad, Cienfuegos, 10 Sept. 1930, Hoya Colorado, Hav. Pr., 23 Aug. 1917, H. Morrison; 1 ♀, near Santiago, 31 Aug. 1917, H. Morrison (USNM); 1 ♂, Soledad nr. Cienfuegos, 6—20 Aug., N. Banks; 1 ♀, Soledad, 24 Aug. 1927, C. 112, on flowers of *Kallstroemia maxima*, J. G. Myers; 1 ♂, Havana, Baker 3614, P. Cameron Coll. 1914—110, with label "*Psen argentifrons* Cr." (BM); 1 ♀ and 1 ♂, Havana, Baker, "*Pluto argentifrons* (Cresson) det. L. Stange" (IML); 2 ♀ and 1 ♂, Pinar del Rio, 16—29 May 1933, H. J. MacGillavry (MA); 2 ♀ and 19 ♂, Soledad nr. Cienfuegos, 6—20 Aug., Richard Dow, "*Psen (Psen) argentifrons* Cress."; 1 ♂, Banes, 4—11 June 1927, F. T. Baird; 2 ♂, Regla to Casa Blanca, 13 Aug. 1930 (MCZ); 2 ♂, Havana, Baker, Univ. of Kansas, Lot 940, "*Psen (Psen) argentifrons*" (KU); 2 ♂, Baracoa, Aug. 1902, Aug. Busck; 1 ♀, Havana, Baker, "*Psen argentifrons* Cr."; 2 ♂, Havana, Baker; 1 ♂, Santiago de las Vegas, 3 July 1917, P. Cardin; 1 ♀ and 3 ♂, Laquito Marianno Hab., March 1967, P. Alayo, "*Pluto argentifrons* (Cress.) det. P. Alayo 1968" (USNM).

New records from Jamaica: 2 ♀ and 11 ♂, Liguanea Plain, Nov.—Dec. 1911, C. T. Brues; 1 ♂, Newton, 3000 ft, Jan. 1912, C. T. Brues (MCZ); 1 ♀, Univ., Mona, 16 June 1970, A. Raw; 1 ♂, St. Andrew Univ., 16 June 1971, *Phyllanthus*

(Euphorbiaceae), A. Raw (BM); 2 ♀, Trelawny, Good Hope, 22 Aug. 1966, H. F. Howden; 1 ♀, Trelawny, Duncans, 23 Aug. 1966, Howden and Becker (CNC); 1 ♀, Duckenfield, E. Jamaica, 12 July 1962, G. F. Mees (ML); 2 ♀, United Fruit Farm, Spanishtown, 11 Sept. 1917, H. Morrison; 1 ♂, Kingston, 9 Sept. 1917, H. Morrison; 1 ♂, Portland, Dover, 7 Aug. 1947, G. B. Thompson; 1 ♂, St. Catharine,Amity Hall, Bushy Park, 20 March 1947, G. B. Thompson; 1 ♀, St. Catharine, Old Harbour, 20 Oct. 1957, T. H. Farr; 1 ♀ and 1 ♂, Trelawny Parish, Windsor Estate, 29 July 1962, Farr, O. and R. Flint (USNM).

First records from Mexico: Yucatán: 1 ♀, Yaxcopoil, Oct. 1950, N. L. H. Krauss (USNM); Chiapas: 1 ♂, San Cristóbal de las Casas, 7200 ft, 30 May 1969, W. R. M. Mason (CNC). First record from Nicaragua: 7 ♂, Granada, Baker (UCD).

P. argentifrons is easily distinguished by the very densely and finely punctate mesopleura, more coarsely punctate in the male, and the brown hind tarsi. It resembles *P. atricornis* which has a more eastern distribution, from Hispaniola to Antigua (Leeward Islands). In the female of the latter species the sculpture of the mesopleura is much coarser, distinct transverse rugae being present; the male of *atricornis* has no tyloidea on the fifth and sixth antennal segments which *argentifrons* has.

Pluto atricornis (Malloch)
(fig. 27)

Malloch, 1933: 57—58, ♂ only, ♀ misidentified (*Psenia atricornis*; Puerto Rico).
Pate, 1946: 9—10, ♂ (*Pluto atricornis*, comb. nov.).
Bohart & Menke, 1976: 171.

First description of female. — Length about 6.5 mm. Black; mandibles and underside of flagellum reddish-brown. Tegulae yellowish-red. Pronotal tubercles whitish. Foreside of fore tibiae, base and outer side of mid tibiae and basal third of hind tibiae, fore basitarsi with next segment, and mid basitarsi yellowish-white. Veins of wings dark brown.

Protruding median part of clypeus less than half total width of margin, very slightly emarginate with indistinct tooth in the middle (fig. 27) and small rectangular lateral angles; disk densely punctate. Frons densely punctate. Interocellar area sparsely punctate, vertex more densely so with tendency to transverse striation. Intercarinal space about as wide as first basitarsus. Antennal segments 10—11 shorter than broad.

Lateral pronotal angles sharp. Scutum and scutellum shining, scutum moderately densely finely punctate, interstices partly larger than punctures, scutellum sparsely punctate. Mesopleura finely alutaceous, upper half with coarse longitudinal rugae and indistinct punctures, lower half punctate, interstices about size of punctures, mesosternum finer and more widely punctate. Hypo-epimeral area densely finely punctate. Anterior plate of mesepisternum with oblique rugae which continue into anterior oblique suture. Enclosed area of propodeum shining, back somewhat dull, densely reticulato-carinate, dorso-lateral carinae parallel. Second recurrent vein of fore wings ending in third submarginal cell. Petiole about

half length of first tergite, this tergite little longer than broad. Pygidial area about twice as long as broad.

Face pale golden or silvery, mostly appressed pubescent, pygidial area dark brown or golden-brown pubescent, rest of body yellowish-grey.

Male. — More slender than female. Fore and mid tibiae yellowish-red. Protruding median part of clypeus about 1/4 of total width of margin. Antennae slender, segments about 1.5 times as long as broad, segments 7—12 with long linear tyloides, segment 13 with short tyloides. Mesopleura more shining, on dorsal half irregularly rugoso-punctate, on lower part rather densely punctate. Petiole about 3/4 length of first tergite, this tergite about 1.5 times as long as broad. Face silvery.

Material examined: Puerto Rico, 1 ♀, Mayaguez, 13 May 1931, No. 8, Oramas, with label "This is apparently the true ♀ of *atricornis* Mall., det. Karl V. Krombein 1941" (USNM).

New records from Puerto Rico: 1 ♂, Coamo Sp'gs, 5—7 June 1915, Dept. Invert. Zool. No. 22320; 1 ♂, Manatí, 27—29 June 1915 (AMNH); 1 ♂, "L jas", Sept.—Nov. 1960, M. Santiago (USNM).

First records from Haïti: 3 ♂, Damien, 7 Aug. 1977; 1 ♀ and 1 ♂, Léogane, 10 Aug. 1977, A. Pauly (FAG).

First records from Dominican Republic: 3 ♂, Santo Domingo, 8 mi up Macoris River, 16 July 1917, H. Morrison; 1 ♂, San Christóbal, 26 July 1917, H. Morrison (USNM).

First records from Virgin Islands: 1 ♀, St. Croix, Christansted, by net No. 1296, USNM Ins. No. 161551, Lot No. 41.20612, 1940, H. A. Beatty (USNM); 1 ♀, St. Croix, East Point, 3—7 Febr. 1969, H. E. Evans, with label "*Pluto atricornis* Mall., ♀, det. H. Evans 1969" (MCZ).

First record from Leeward Islands: 1 ♂, Antigua I., Body Ponds, 12 June 1965, E. and S. Geijskes (ML). This male has a somewhat longer petiole, about 4/5 length of first tergite.

P. atricornis differs from other *Pluto* in having a broad intercarinal space, rugose mesopleura, a short petiole and a black gaster, the male also in having no tyloides on antennal segments 4—6.

Pluto alphitopus sp. nov.
(fig. 29)

Female. — Length about 6 mm. Black. Mandibles reddish, apical half of underside of flagellum reddish-brown. Bases of fore and mid tibiae yellowish-white, foreside of fore tibiae yellowish-brown. Fore and mid tarsi yellowish-white, last segment brown. Base of hind tibiae yellowish-brown; basal 3/4 of hind basitarsus brown, apex and segments 2—4 yellowish-brown with somewhat darker bases. Tegulae yellowish-brown. Pygidial area dark reddish. Veins of wings dark brown.

Clypeal margin very indistinctly trilobate or bisinuate (fig. 29), disk convex, densely punctate. Frons densely punctate, vertex finely punctate and finely transversely striate. POD somewhat larger than OOD. Intercarinal space narrow. Antennae short, slightly clavate, segments 9—11 shorter than broad.

Lateral pronotal angles about rectangular. Scutum shining, anterior margin densely punctate, rest of scutum irregularly punctate, interstices often larger than punctures. Scutellum shining, mostly sparsely punctate, posterior margin densely punctate. Back of propodeum dull, coriaceous, mostly obliquely striate, enclosure with a few oblique carinae and large median area. Mesopleura, mesosternum and hypo-epimeral area dull, densely punctate, upper part of mesopleura also finely longitudinally striate. Hypo-epimeral area dull, densely finely punctate. Anterior plate of mesepisternum striate, oblique suture indistinctly crenulate. Petiole about half length of first tergite, this tergite about as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Face pale golden, scutum greyish-brown, pygidial area dark brown, rest of body yellowish-silvery or yellowish-grey pubescent.

Male. — Resembling female. Length about 6 mm. Fore tibiae, outer side of mid tibiae and base of hind tibiae yellowish-brown. Tarsi pale yellowish-white except for last segment and base of hind basitarsi, fore and mid basitarsi almost whitish.

Antennae slender, segments 11—12 about 1.5 times as long as broad, last segment about 2.5 times as long as broad, segments 7—10 in lateral view raised in the middle. Segments 4—13 with linear tyloides, on segments 4—6 as long as segment, shorter on segments 7—12, very short on segment 13.

Scutum more closely punctate or somewhat rugoso-punctate. Scutellum densely punctate, finely reticulate alutaceous. Lower part of propodeum more distinctly reticulato-carinate. Punctation of mesopleura more superficial than in female and punctato-reticulate, no distinct rows of punctures; hind margin finely coriaceous. Punctation of hypo-epimeral area finer than on mesopleura. Gaster slender, petiole about 2/3 or half length of first tergite, this tergite about 1.5 times as long as broad. Face silvery, rest of body silvery or whitish pubescent.

Mexico: Guerrero: 1 ♀, holotype, 20 mi west Acapulco, 10 Aug. 1962, 1 ♂ (no antennae), paratype, same locality, 11 Aug. 1962, Univ. Kansas Mexican Exped. (KU). Jalisco: 1 ♂, allotype, Jocotepec, 5000 ft, 11 July 1959, H. E. Evans (CU). Michoacan: 1 ♂, paratype, 11 mi east Apatzingán, 20 Aug. 1954, E. G. Linsley, J. W. MacSwain, R. F. Smith (UCD). Oaxaca: 1 ♂, paratype, Crawford (UCD); hind basitarsi entirely whitish. Puebla: 1 ♂, paratype, 30 mi northwest Acatlán, 14 Aug. 1972, G. F. and S. Hevel (USNM).

The male of *P. alphitopus* resembles that of *P. castaneipes*, but its tyloidea are different and the tarsi are whitish. The female of the latter species is still unknown. The sculpture of the mesopleura of the female of *P. alphitopus* is very similar to that of *P. strigellus*; unfortunately the male of latter species has not yet been found.

The specific name, derived from the greek nouns ἀλφιτον and πουσ, refers to the floury colour of the tarsi of the male.

Pluto castaneipes sp. nov.

Male. — Length about 6.5 mm. Black. Outer 2/3 of mandibles dark reddish. Underside of flagellum of antennae brown, of last segment orange-brown. Apical half of foreside of fore femora, fore tibiae and base of mid tibiae reddish-brown; hind tibiae and all tarsi brown, base of hind tibiae paler. Veins of wings black.

Median part of clypeal margin somewhat protruding, about 1/4 of total width of margin. Frons densely punctate, no interstices. Vertex transversely striate, punctation indistinct. POD about 1.5 times OOD. Intercarinal space linear. Antennae slender, segments 11—12 over 1.5 times as long as broad, segment 13 over twice as long as broad. Segments 4—12 with linear tyloidea, as long as segments, on segments 11—12 somewhat shorter, segment 13 with very small tyloides. Tyloidea below much roundly raised, in lateral view highest point on segments 7—11 near middle of segment.

Lateral pronotal angles about rectangular. Scutum shining, anteriorly dull, densely coarsely punctate, interstices distinct, some superficial transverse rugae. Scutellum shining, densely punctate, interstices mostly larger than punctures. Propodeum dull, enclosure medially irregularly carinate, back coarsely reticulato-carinate. Mesopleura dull, reticulate alutaceous, densely punctate and striato-punctate, hind margin coarsely coriaceous. Hypo-epimeral area dull, densely punctate. Anterior plate of mesepisternum dull, finely striato-punctate, oblique suture narrow. Mesosternum somewhat shining, densely finely punctate. Second recurrent vein of fore wings ending in third submarginal cell. Petiole about 2/3 or 3/4 length of first tergite, this tergite about 1.5 times as long as broad.

Face, tempora and pronotal collar silvery, mostly appressed, pubescent. Also rest of body silvery-white pubescent, dense and somewhat appressed on mesopleura.

Female unknown.

New Mexico, USA: 1 ♂, holotype, Rodeo, 4—5000 ft, 14 Sept. 1958, at *Asclepias*, H. V. Weems Jr. (FSC).

Texas, USA: 1 ♂, paratype, Howard Co., 15 mi northwest Big Spring, US Highway 87, 13 June 1963, D. C. and K. A. Rentz (CAS).

The long antennal segments with much raised tyloidea and the dark tarsi distinguish *P. castaneipes* from other black species belonging to the group of *P. argentifrons*; it differs from the next species by the sculpture of the propodeum and the dark colour of the pronotal tubercles and of the gaster.

The specific name refers to the brownish colour of the legs.

Pluto rugulosus sp. nov.

Male. — Length about 6 mm. Head and thorax black; mandibles yellow with reddish tips, underside of flagellum orange-brown. Thorax black, pronotal tubercles yellow. Foreside of fore femora and fore tibiae yellowish-red, tarsi yellowish-brown. Apex of mid femora and foreside of tibiae yellowish-red, tarsi brown, Basal 1/4 of hind tibiae yellowish-white, tarsi dark brown, apices of tarsal

segments pale. Gaster black, narrow hind margin of first tergite, apical 1/3 of tergite 2 and all of tergite 3 red. Veins of wings brown, base of stigma with whitish spot.

Median part of clypeal margin straight, slightly protruding. Disk of clypeus dull, very densely punctate. Frons and vertex densely punctate; frons convex and somewhat shining, vertex behind ocelli finely transversely striate. POD nearly twice OOD. Intercarinal space narrow. Tempora finely striate. Antennal segments about 1⅓ times as long as broad, last segment twice as long as broad, segments 3—12 with fine linear tyloides, less distinct on segment 3, on most segments as long as segment.

Lateral pronotal angles obtuse. Scutum very shining, coarsely punctate, partly rugoso-punctate. Scutellum shining, posteriorly densely punctate. Propodeal enclosure entirely irregularly reticulate. Back of propodeum finely rugulose, dorso-laterally indistinctly finely striate. Mesopleura shining, densely strongly punctate, partly striato-punctate. Hypo-epimeral area somewhat dull, same punctation. Anterior plate of mesepisternum dull, densely finely punctate. Anterior oblique suture narrow, not distinctly crenulate. Petiole about 3/4 length of first tergite, this tergite about 1.5 times as long as broad. Gaster slender. Second recurrent vein of fore wings ending well in third submarginal cell.

Pubescence silvery-white, on face and pronotal collar mostly appressed, last segment somewhat brownish.

Female unknown.

Texas: 1 ♂, holotype, Big Bend, 5000 ft, 1 Aug. 1975, S. and J. Peck (HT).

This species belongs to the group of *argentifrons*, is very close to *P. castaneipes*, but differs in the tyloidea of the antennae, the sculpture of the propodeum and in the colour of the gaster.

The specific name refers to the fine rugosity of the back of the propodeum.

Pluto colonensis sp. nov.
(fig. 28)

Female. — Very similar to *P. argentifrons* (Cresson). Underside of flagellum, and fore tibiae and tarsi yellowish-red. Fore basitarsus white. Mid tibiae largely brown, basitarsus whitish. Hind tibiae and tarsi dark brown, base of tibiae whitish. Pronotal tubercles whitish. Hind margin of first tergite, all of second tergite and base of third tergite reddish.

Clypeal margin (fig. 28) weakly emarginate, no median projection as in *P. argentifrons*. POD slightly larger than OOD. Scutum shining, punctation coarser than in *P. argentifrons* and more dense, especially on central part and on fore and hind margins. Mesopleura dull, very finely and densely punctate, no distinct longitudinal striae as in *P. argentifrons*. Back of propodeum dull, lower part finely reticulato-carinate with large meshes. Petiole about half length of first tergite, this tergite somewhat longer than broad. Pygidial area about twice as long as broad.

Pubescence of face silvery, of pygidial area brown, of rest of body whitish.

Male unknown.

Argentina: 1 ♀, holotype, prov. Entre Rios, Dt. Colón, Zelich (MF).

Pluto fritzi sp. nov.

Male. — Length about 6—7 mm. Black. Mandibles dark reddish except for basal 1/3. Underside of flagellum orange-brown. Foreside of fore femora, apex of foreside of mid femora, fore and mid tibiae and tarsi orange-brown, basitarsi somewhat paler. Hind tibiae and tarsi orange-brown, underside of tibiae, bases of hind tarsal segments 1—3 and last segment of tarsi brown. Tegulae reddish-brown. Wings somewhat smoky, veins black, fine pubescence of wings dark brown. Hind margins of gastral tergites broadly reddish transparent.

Median part of clypeal margin straight, somewhat protruding, disk densely punctate. Frons except for lateral margins densely rugoso-punctate. Vertex densely punctate, interstices shining, back of head dull, transversely striato-punctate. POD larger than OOD. Intercarinal space narrow. Antennal segments longer than broad, last segment over 1.5 times as long as broad, segments 4—12 with linear tyloides as long as segment, tyloides on segment 13 short.

Lateral pronotal angles about rectangular. Scutum shining, strongly punctate, partly transversely or obliquely rugulose. Scutellum shining, sparsely punctate, hind margin densely punctate. Propodeal enclosure shining, large median area, oblique carinae lacking or sparse. Back of propodeum very coarsely reticulato-carinate. Mesopleura shining, densely rugoso-punctate. Hypo-epimeral area shining, finely punctate, interstices about size of punctures. Anterior plate of mesepisternum vertically striate, oblique suture broad, crenulate. Mesosternum densely finely punctate. Second recurrent vein of fore wings interstitial. Petiole somewhat longer than first tergite, this tergite longer than broad.

Pubescence of face yellowish-silvery, not distinctly appressed; pubescence silvery, mostly appressed on tempora and pronotal collar, yellowish-grey on scutum, scutellum and metanotum.

Female. — A separately collected female is very similar and provisionally considered the female of *P. fritzi*. Length about 7.5 mm. Fore femora dark, base of hind tibiae dark, hind tarsi brown, apices of segments paler.

Anterior margin of clypeus slightly rounded, disk densely punctate. Frons densely punctate, lateral raised parts shining, vertex sparsely punctate. POD slightly less than OOD. Intercarinal space about half width fore basitarsus. Antennal segments 10—11 about as long as broad.

Scutum very shining, punctures sharp, interstices often larger than punctures. Propodeal enclosure with a few oblique carinae, large median area; back of propodeum coarsely reticulato-carinate. Mesopleura somewhat irregularly densely punctate, hind margin with short rugae. Mesosternum densely punctate. Hypo-epimeral area as in male. Petiole about as long as first tergite. Pygidial area about twice as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Face golden pubescent.

Ecuador: 1 ♂, holotype, Chone, May 1976, 1 ♂, paratype, Quevedo, May 1976, M. Fritz (MF); 1 ♀, allotype, Guayaquil, 4 March 1964, R. O. Schuster (UCD); 1 ♂, paratype, Pto. Viejo-Quevedo, 400 m, 13 April 1965, L. Peña (MCZ). This latter male has the nace pale golden.

P. fritzi seems to belong to the group of *P. argentifrons* which is characterized by the densely punctate mesopleura. The petiole of the male is longer than that of any other species of the group, the mesopleura and especially the hypo-epimeral area are shining between the punctures.

This species has been named in honour of the Argentine hymenopterist Mr. Manfredo A. Fritz.

Pluto medius medius (F. Smith)
(fig. 33)

Smith, 1856: 435, ♂ (*Psen medius*; Brazil).
Dalla Torre, 1897: 348.
Bohart & Menke, 1976: 171 (*Pluto medius*, new combination by Bohart).

First description of female. — Length about 6.5 mm. Black. Underside of flagellum orange-brown, labrum and mandibles reddish-brown. Pronotal tubercles yellowish-white, tegulae yellowish-red. Hind margin of first tergite, all of second tergite and sternite, sometimes also third tergite and sternite more or less red, following segments with broad reddish transparent hind margin, last segment dark reddish. Fore and mid tibiae and tarsi yellowish-red, basitarsi whitish. Basal 1/3 of hind tibiae and basitarsi except base yellowish-white, segments 2—5 brown, with paler apex. Veins of wings dark brown.

Median part of clypeal margin shining, less than half total width, medially very slightly rounded and with small but distinct lateral teeth (fig. 33). Frons densely punctate, upper part raised, a large, narrow, shining depression between posterior ocelli and oculi. Vertex shining, sparsely punctate. Intercarinal space very narrow. Antennae slightly clavate, not long.

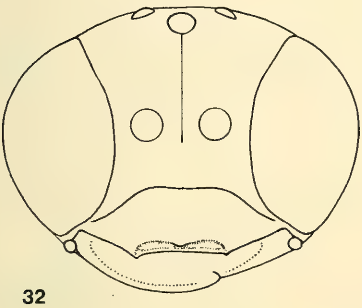
Lateral pronotal angles rectangular. Scutum shining, interstices a few times size of punctures, anterior margin dull. Scutellum shining, sparsely punctate. Propodeal enclosure shining, with large pentagonal area, back dull, coarsely reticulato-carinate, dorso-lateral carinae parallel. Mesopleura finely reticulate alutaceous, upper part densely finely punctate, interstices on lower part as large as or slightly larger than punctures, posterior margin finely coriaceous. Mesosternum densely very finely punctate. Hypo-epimeral area somewhat shining, very finely punctate. Anterior plate of mesepisternum finely striate. Second recurrent vein of fore wings ending well in third submarginal cell. Petiole about as long as first tergite, this tergite somewhat longer than broad. Pygidial area about twice as long as broad.

Pubescence of face golden, mostly appressed. Vertex, scutum and pygidial area brownish pubescent, mesonotum, mesosternum and gaster greyish pubescent, propodeum whitish.

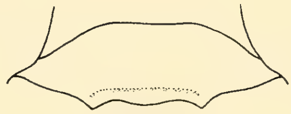
Male. — Hind basitarsi brown of largely yellowish. Sculpture of scutum coarser,

some short transverse rugae. Scutum laterally and anteriorly somewhat transversely rugose, anterior margin moreover densely punctate, dull. Scutellum posteriorly more rugose. Mesopleura dull or shining, very densely finely punctate, partly striato-punctate. Petiole slightly longer than first tergite. Antennal segments 4—11 with linear tyloides, shorter than segment, on segment 11 much shorter.

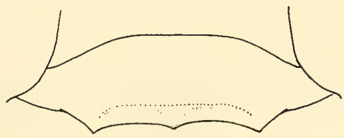
Face silvery pubescent.



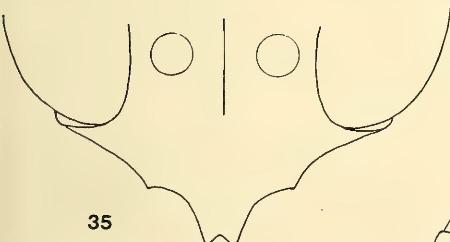
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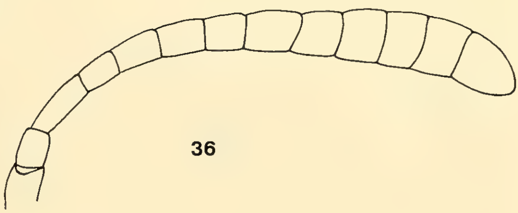
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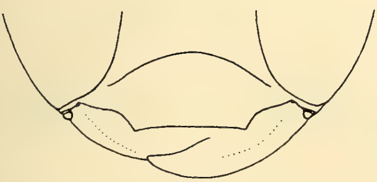
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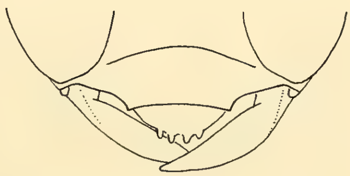
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Fig. 32. *Pluto scytinus* sp. n., ♀, holotype, head in frontal aspect. Fig. 33. *P. medius medius* (Smith), ♀, Brazil, clypeus. Fig. 34. *P. medius zuliensis* subsp. n., ♀, holotype, clypeus. Figs. 35—36. *P. clavicornis*, Mexico; 35, face of ♀ in antero-dorsal aspect; 36, antenna of ♂, dorsal aspect. Fig. 37. *P. townsendi* (Cockerell), ♀, Peru, clypeus. Fig. 38. *P. metaensis* sp. n., ♀, clypeus.

Material examined: Brazil: 1 ♂, Santarém, "*medius* Sm. Type", BM type Hym. 21.815; 1 ♂, Santarém, "*Psen medius* Sm." (BM).

New records from Brazil: Pará, 1 ♀ and 1 ♂, 25 July 1901, Ducke, No. 274 and No. 206 (NMW); 1 ♂, Pará, Baker (UCD); Amazonas, 1 ♀ and 1 ♂, Vista Alegre, Rio Branco, 6 Sept. 1924 (CU); Mato Grosso, 1 ♀ and 1 ♂, Diamantino, 10—14 Nov. 1965, S. Laroga (UFP); Roraima, 1 ♂, Surumú, Sept. 1966, M. Alvarenga (HT).

First records from Argentina: Mendoza: 1 ♀, Est Pedregal, 17 Nov. 1906, Jensen-Haarup (ZMC); 1 ♂, 2 Dec. 1906, Jensen-Haarup (ZMB). Tucumán: 1 ♂, Febr. 1947, J. Cordoba (IML). Salta: 1 ♂, Tartagal, 11 Febr. 1950, R. Golbach (IML). Yuto: 2 ♂, 11 Jan. 1966, H. and M. Townes (HT). Catamarca: 3 ♂, Belen, 25 Nov. 1975, R. M. Bohart (UCD).

First records from Bolivia: Tarija, 1 ♀ and 1 ♂, Ing. Bermejo, 14—28 Febr. 1969, R. Golbach (IML).

First record from Surinam: 1 ♂, Paramaribo, Agricult. Experiment Station, 21 Nov. 1963, G. van Vreden (ML).

In the males from Argentina the scutum is not rugose and the mesopleura are shining and finer punctate; the females from Argentina and Bolivia have a silvery pubescent face, the hind tarsi are entirely brown and the lower part of the mesopleura as well as the mesosternum are shining, not distinctly alutaceous. Perhaps these specimens represent a distinct subspecies.

Pluto medius zuliensis subsp. nov.

(fig. 34)

Female. — Resembling nominate subspecies. Length 6.5—8.5 mm. First tergite except for two large black marks, all of tergites 2—3, sides of tergite 4, and sternites 2—4 red. Hind tarsi dark brown, apices of segments yellowish-brown.

Median part of clypeal margin more sharply protruding than in nominate subspecies (fig. 34). Scutum shining, with large impunctate areas. Petiole about 3/4 length of first tergite.

Face deep golden pubescent, pygidial area brown, rest of body whitish pubescent.

Male. — Similar to female. Length about 6.5 mm. First tergite except for two large black marks, all of tergites 2—3, second sternite and base of third sternite red. Hind basitarsus somewhat paler brown. Scutum with smaller impunctate areas, no tendency to rugosity.

Face pale golden pubescent.

Venezuela: Zulia, Carrasquero, 1 ♀, holotype and 1 ♂, allotype, 15 June 1976, 38 ♀, paratypes, 29—30 May and 15 June 1976, A. S. Menke and D. Vincent (holotype and allotype USNM, paratypes UZM and USNM).

Curaçao : 1 ♂, paratype, Gr. Santa Martha, 24 Nov. 1963, on *Sesuvium portulacastrum*, B. de Jong (ML).

This subspecies is on the whole somewhat larger than the nominate subspecies, the gaster shows more red, the hind tarsi are dark brown and the face of the female is deep golden pubescent, the face of the nominate subspecies being pale golden. The clypeal margin is slightly different.

The subspecific name refers to the state of Zulia in Venezuela, where a large series of females has been collected.

Pluto scytinus sp. nov.
(fig. 32)

Female. — Length about 5 mm. Head and thorax black; mandibles yellowish-red, labrum reddish, underside of flagellum yellowish-red. Fore and mid tibiae and tarsi, basal 2/5 of hind tibiae and hind tarsal segments 1—4 yellowish. Outer side of fore and mid tibiae with ivory-white streak. Pronotal tubercles ivory-white. Tegulae yellowish-red. Hind margin of first gastral tergite, all of tergites 2—3, sides of fourth tergite and sternites 2—3 reddish. Apex of last segment dark reddish.

Median part of clypeal margin slightly emarginate, indistinct median tooth, lateral teeth small but distinct, distance less than half total width of margin (fig. 32). Frons very closely finely punctate, laterally with shining area. Vertex finely alutaceous, finely punctate, interstices about twice size of punctures. POD nearly twice OOD. Tempora finely striato-punctate. Intercarinal space about as wide as first basitarsus. Antennae short, clavate, segments 10—11 shorter than broad.

Lateral pronotal angles about rectangular. Scutum shining, densely punctate, interstices larger than punctures. Scutellum shining, sparsely punctate. Propodeal enclosure almost dull, irregularly carinate. Back of propodeum dull, closely reticulate, dorso-lateral parts with oblique parallel carinae. Mesopleura and hypo-epimeral area closely very finely punctate, almost coriaceous, punctation of mesosternum with distinct interstices. Anterior plate of mesepisternum dull, oblique suture narrow. Petiole about half length first tergite. Pygidial area about 1.5 times as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Face and pronotal collar silvery, mostly appressed, pubescent. Pubescence of scutum brownish, of pygidial area brown, of rest of body silvery-white.

Male unknown.

Venezuela: 1 ♀, holotype, Zulia, Rosario, 4 June 1976, A. S. Menke and D. Vincent (USNM).

P. scytinus belongs to the group of *P. argentifrons*. It differs from the South American *P. stramineipes* in having reddish gastral tergites, from the Argentine *P. colonensis* in having yellowish hind tarsi, from both species also in having finer punctate mesopleura.

The specific name refers to the leathery appearance of the mesopleura.

Pluto stramineipes sp. nov.
(fig. 30)

Female. — Length about 6 mm. Black. Mandibles and labrum reddish. Underside of flagellum orange-brown. Pronotal tubercles whitish. Fore and mid tibiae and tarsi brownish-yellow, outer side of fore tibiae with narrow yellow line, basitarsi yellowish-white. Basal 1/3 of hind tibiae and tarsal segments 1—4 yellowish-white. Hind margins of tergites somewhat reddish transparent. Pygidial area more or less reddish. Veins of wings dark brown.

Protruding median part of clypeus almost straight, somewhat less than half total width of margin, medially slightly protruding, lateral teeth small (fig. 30). Disk of clypeus dull, narrow shining anterior margin. Frons densely punctate, except for shining low oval tubercle along eyes. Vertex finely transversely striate, sparsely punctate, interocellar area shining. POD about equal to OOD. Intercarinal space nearly as broad as first basitarsus. Antennae clavate, segments 10—11 much shorter than broad.

Lateral pronotal angles obtuse. Scutum and scutellum shining, finely punctate, interstices mostly a few times size of punctures, punctation close on fore and hind margin. Propodeal enclosure shining, back of propodeum dull, coarsely reticulato-carinate, with fine oblique dorso-lateral striae. Mesopleura densely finely punctate, on median part striato-punctate, near lower margin interstices about as large as punctures, hind margin finely rugulose. Mesosternum densely finely punctate. Second recurrent vein of fore wings ending in third submarginal cell. Petiole about 3/5 length of first tergite, this tergite slightly longer than broad.

Face and pronotal collar silvery, mostly appressed, pubescent. Pygidial area golden-brown pubescent, thorax dorsally greyish, rest of body whitish.

Male. — Similar to female. Hind tarsal segments 2—4 more or less brown. Antennae long and slender, segments about 1.5 times as long as broad, segments 5—10 with linear tyloidea, as long as segments. Vertex and scutum more coarsly punctate. Propodeal enclosure with irregular, shining, large median area. Sculpture of back of propodeum coarser than in female. Petiole subequal to first tergite, this tergite about 1.5 times as long as broad.

Brazil: Santa Catarina: Nova Teutonia, 27°11'S., 52°23'W., 300—500 m, 1 ♀, holotype, 28 Jan. 1956, Fritz Plaumann (CU); 1 ♂, allotype, 14 Nov. 1964; paratypes: 1 ♂, 17 Jan. 1964, 8 ♂, Oct.—Nov. 1968, 1 ♂, Nov. 1969, all collected by Fritz Plaumann (UCD). Further paratypes from this locality: 2 ♀, 8 Nov. 1962 and 1 Febr. 1963, 5 ♂, Oct.-Nov. 1967, Fritz Plaumann (MCZ); 1 ♀, Nov. 1974, Fritz Plaumann (BM). Mato Grosso: 1 ♀, paratype, Aquidana, 11—13 Dec. 1919, R. G. Harris, Cornell Univ. Exped. (CU). Paraná: 1 ♀, paratype, Falls Iguazú, Jan. 1962, Sakagami-Laroca (UFP).

Argentina: Misiones: 1 ♀, Posadas, 15—24 Jan. 1920, Cornell Univ. Exped., Lot 569 (CU). Entre Rios: 2 ♂, Pronunciamento, 13—16 Febr. and 4—10 March 1965 (FAG); 1 ♂, Feliciano, Dec. 1972, M. A. Fritz (MF). All paratypes.

Bolivia: 3 ♀, Luis Calvo, Tiguipa, Jan. 1972, M. A. Fritz (MF). Paratypes.

The male of *P. stramineipes* differs from the other species of the group of

argentifrons in having tyloidea on segments 5—10 only and in having pale hind tarsi.

The specific name refers to the straw-coloured hind tarsi, especially those of the male.

Pluto strigellus sp. nov.
(fig. 31)

Female. — Length about 5.5 mm. Black. Mandibles and labrum largely reddish. Underside of flagellum reddish. Pronotal tubercles whitish, tegulae yellowish. Fore tibiae and tarsi yellowish-red, base of tibiae and tarsal segments 1—3 yellowish-white. Mid tibiae brown, base and outer side of apex yellowish, tarsal segments 1—3 yellowish-white. Hind legs brown, base of tibiae yellowish, apices of tarsal segments yellowish-brown. Apices of first tergite, all of second tergite and base of third tergite reddish. Veins of wings dark brown.

Protruding median part of clypeal margin slightly bisinuate, with distinct small lateral teeth (fig. 31). Disk of clypeus densely finely punctate. Frons densely finely punctate, vertex shining, sparsely punctate. POD slightly larger than OOD. Intercarinal space narrow. Antennae slightly clavate, segments 10—11 about quadrate, segment 12 about 1.5 times as long as broad.

Lateral pronotal angles obtuse. Scutum shining, distinctly, sparsely, punctate. Scutellum shining, sparsely punctate, posteriorly some short rugae. Propodeal enclosure shining, irregularly carinate. Back of propodeum coriaceous, dorso-lateral parts obliquely striate, lower part irregularly reticulato-carinate. Meso-pleura dull but lower part somewhat shining, densely finely punctate, interstices about size of punctures, upper half finely, almost indistinctly, longitudinally striato-punctate. Mesosternum shining, densely finely punctate. Hypo-epimeral area dull, densely very finely punctate. Anterior plate of mesepisternum dull, sculpture indistinct, oblique suture crenulate. Petiole about 2/3 of lenght of first tergite, this tergite about as long as broad. Pygidial area almost twice as long as broad. Second recurrent vein of fore wings interstitial.

Face silvery, mostly appressed, pubescent. Vertex and dorsum of thorax brownish pubescent, pygidial area brown, rest of body whitish pubescent, densely so on mesopleura.

Male unknown.

Argentina: Santa Fé, Alberdi (near Rosario), strand, 890, 1 ♀, holotype, 24 Nov. 1911; Alberdi, 1 ♀, paratype, 4 Febr. 1917, J. Hubrich (BSM).

The sculpture of the thorax and the shape of the clypeal margin closely resemble those of *P. alphitopus*; the clypeal margin point to close relationships with *P. medius* as well, but in the latter species the front is raised before the posterior ocelli, while this is hardly so in *P. strigellus*.

The specific name refers to the fine striae on the mesopleura.

Group of *clavicornis*

Pluto clavicornis (Malloch)
(figs. 35—36)

Malloch, 1933: 50—51, ♂ (*Psenia clavicornis*; Arizona).
Krombein, 1951: 962 (*Pluto clavicornis*, comb. nov.).
Bohart & Menke, 1976: 171.

First description of female. — Length about 6.5 mm. Black. Mandibles, labrum and underside of flagellum yellowish-red. Pronotal tubercles yellowish-white. Tegulae reddish-brown. Fore and mid tibiae and tarsi largely yellowish-brown, basitarsi whitish. Basal third of hind tibiae yellowish-white, tarsi yellowish-white or largely brownish. Gaster black, hind margins of tergites and pygidial area reddish-brown. Veins of wings dark brown.

Clypeal margin strongly snoutlike protruding, apex bidentate, laterally with small triangular tooth (fig. 35); protruding part in ventral view flattened, finely reticulate alutaceous. Disk of clypeus somewhat shining, indistinctly punctate. Frons shining, densely superficially punctate, raised near anterior ocellus, a longitudinal narrow depression between posterior ocelli; a shining raised area near oculi. Vertex shining, sparsely finely punctate. POD somewhat smaller than OOD. Ventral part of occipital carina high, intercarinal space about as wide as first basitarsus. Antennae clavate, short, segments 11—12 shorter than broad.

Lateral pronotal angles sharp. Scutum and scutellum somewhat shining, very finely reticulate alutaceous, sparsely finely punctate. Propodeal enclosure shining, large median area with a median carina. Back of propodeum dull, coarsely reticulato-carinate. Mesopleura, hypo-epimeral area and mesosternum somewhat shining, very finely reticulate alutaceous, mesopleura sparsely finely punctate. Anterior plate of mesepisternum dull, oblique suture broad, crenulate. Second recurrent vein of fore wings interstitial or ending in third submarginal cell. Petiole as long as first tergite, this tergite 1.5 times as long as broad. Pygidial area about 1.5 times as long as broad.

Face silverly to pale golden, mostly appressed, pubescent, pubescence on thorax greyish, on pygidial area reddish-brown, on rest of body whitish.

Male. — Length about 6—6.5 mm. Very similar to female apart from the sexual dimorphism. Clypeal margin almost straight, with two very small teeth at about 1/3 of total width. Antennae (fig. 36) short and clavate, no tyloidea. Face silvery.

Thus far recorded from Arizona only.

First records from Mexico: Guerrero: 4 ♂, Xalitla, 1500 ft, 20 March 1959, H. E. Evans and D. M. Anderson (CU): 1 ♂, 9 mi south Tierra Colorado, 21 July 1963, F. D. Parker and L. A. Stange (UCD). Morelos: 1 ♂, 3 mi north Alpuyeca, 3400 ft, 9 March 1959, H. E. Evans and D. M. Anderson; 6 ♂, same locality, 23 March 1959, H. E. Evans (CU). Oaxaca: 1 ♂, Crawford (UCD). Sinaloa: 113 ♂, 8 mi southeast Elota, 18—19 May 1962, F. D. Parker and L. A. Stange (UCD); 1 ♀ and 1 ♂, same locality, 18 May 1962, F. D. Parker and L. A. Stange, with label "*Pluto clavicornis* det. Stange" (IML); 2 ♀, Mazatlán, 10 ft, 20 July 1959, H. E. Evans (CU); 2 ♀,

Mazatlán, 6 Aug. 1964, W. R. M. Mason (CNC); 2 ♂, 11 mi north Culiacán, 20 May 1962, F. D. Parker (UCD); 1 ♀ and 4 ♂, 21 mi east Villa Union, 1 Febr. 1964, E. I. Schlinger (UCD, 1 ♂ CAS). Sonora: 1 ♂, Alamos, 13 June 1961, F. D. Parker (UCD). Veracruz: 7 ♂, July 1965, N. L. H. Kraus (USNM).

P. clavicornis is easily recognized by the conspicuous snout of the female, the male by the clavate antennae.

Group of *townsendi*

Pluto townsendi (Cockerell)
(fig. 37)

Cockerell, 1911: 272, ♀ and ♂ (*Psenulus (Neofoxia) Townsendi*; Peru).
Bohart & Menke, 1976: 171 (*Pluto townsendi*, new combination by Bohart).

Female.—Length about 5.5 — 6 mm. Black. Mandibles and labrum reddish, underside of flagellum yellowish-red. Pronotal tubercles and part of tegulae yellowish-white. Apices of all femora, fore and mid tarsi and greater part of fore and mid tibiae yellowish-red, fore basitarsi whitish, outer side of mid tibiae whitish. Basal 1/3 of hind tibiae yellowish, hind tarsi largely brown. Narrow hind margin of first tergite, all of second tergite, third tergite except for a black apical triangle (rarely its base only), and sternites 2—3 red. Last gastral segment dark reddish. Veins of wings brown.

Median part of clypeal margin very weakly emarginate, with short lateral teeth, distance between these teeth about half total width of margin (fig. 37). Disk of clypeus densely punctate. Frons somewhat shining, very finely punctate. Vertex shining, punctation indistinct. POD about equal to OOD. Intercarinal space narrow. Antennae clavate, segments 10—11 about quadrate, last segment about 1.5 times as long as broad.

Lateral pronotal angles obtuse. Scutum but for anterior margin shining, also scutellum, sparsely punctate. Metanotum coriaceous. Back of propodeum and enclosure dull. Enclosure with a few fine oblique carinae, back finely reticulato-carinate with large meshes, dorso-lateral parts almost smooth with some fine striae. Mesopleura and mesosternum somewhat dull, dorsal half of mesopleura with very indistinct punctures, hind margin shining, very finely, almost indistinctly, coriaceous; mesosternum densely, more distinctly punctate. Hypo-epimeral area shining, no distinct punctures. Anterior plate of mesepisternum dull, finely sculptured. Anterior oblique suture narrow, crenulate. Second recurrent vein of fore wings interstitial. Petiole about 3/4 length of first tergite, this tergite about 1.25 times as long as broad. Pygidial area triangular, over 1.5 times as long as broad.

Pubescence of face silvery, mostly appressed. Pubescence of vertex and scutum somewhat greyish or brownish, of pygidial area golden-brown, of rest of body whitish, rather dense on tempora, pronotal collar, metanotum and mesopleura.

Male. — Similar to female, more slender, gaster darker. Length about 5 mm. Gaster black or dark brown, tergites 2—3 with narrow red hind margin, some specimens with apical half of second tergite and nearly all of third tergite red. Basal third of hind tibiae whitish, all tarsi yellowish-white, last segment of hind tarsi and base of hind basitarsus more or less darkened.

Clypeal margin slightly roundly protruding. Antennae about as long as head and thorax together, segments 3—12 about twice as long as broad, segment 13 over twice as long as broad. Segments 4—9 with long and fine linear tyloidea, sometimes indistinct on segment 4, shorter on segment 9, often also segment 10 with a small tyloides. Scutum densely finely punctate. First gastral tergite about 1.5 times as long as broad.

Material examined: 1 ♂, "Piura Apl. 28 (Twns), "*Psenulus (Neofoxia) Townsendi* Ckll. Type ♂" (USNM, type No. 14096). Piura is a town on the river Piura in Peru.

New records from Peru: 2 ♀ and 20 ♂, Piura, Ostendorf S. G. (ZMB).

First records from Ecuador: 2 ♀, Guayas Prov., Guayaquil, 3—5 March 1964, P. D. Ashlock (BISH); 8 ♀ and 2 ♂, Manabi Prov., Chone, May 1976 (MF); 1 ♂, 35 km southeast Bahia de Caráquez, 10 May 1975, Ashley B. Gurney (USNM). One ♀ and one ♂, labelled "Puna, Kinb." (RS) have been collected by Dr. J. G. M. Kinberg, who joined the voyage around the world by the Royal Swedish frigate Eugenie in 1851—1853 as a zoologist. According to Persson (1971) insects with label "Puna" have been collected on the isle of Puná, Guayas Prov. on 27 March 1852 but he thinks that it is also possible that they were collected in or around Guayaquil during the period 28 March—4 April 1852. Dr. S. Erlandsson, Stockholm, kindly called my attention to this publication.

The group of *townsendi* is easily recognized by the weakly shining, almost imperceptibly sculptured mesopleura of the female and the long antennae of the male. *P. townsendi* is distinguished from the other two taxa belonging to this group by its shorter petiole.

Pluto marthae sp. nov.

Female. — Lenght about 6 mm. Head and thorax black; mandibles yellowish-red, labrum dark reddish. Underside of flagellum orange-brown. Pronotal tubercles yellowish-white. Tegulae yellowish-red. Fore and mid tibiae and apices of femora yellowish-brown, basitarsi whitish, mid part of tibiae and last tarsal segment brown. Basal third of hind tibiae yellowish-white, hind tarsi brown with yellowish-brown apices. Petiole and basal half of first tergite black, remainder of gaster red, bases of some segments may be slightly darkened. Veins of wings dark brown.

Median part of clypeal margin less than half total width, straight or in the middle very slightly convex, shining, with two small lateral teeth; disk densely finely punctate. Frons not distinctly punctate, central part dull. Vertex impunctate, shining between ocelli and oculi, dull behind ocelli. Intercarinal space narrower than first basitarsus. Antennae somewhat thickening towards apex, segments 9—11 about quadrate, last segment slightly over 1.5 times as long as broad.

Lateral pronotal angles nearly rectangular. Scutum shining, sparsely finely punctate, anteriorly and near hind margin somewhat dull, owing to minute hairbearing punctures. Scutellum shining, almost impunctate. Metanotum dull, coriaceous. Propodeal enclosure triangular, with large pentagonal median area, shining. Back of propodeum dull, with moderately coarse, reticulate carination, carinal dorsally more parallel. Mesopleura, hypo-epimeral area and mesosternum somewhat dull owing to indistinct reticulate alutaceous microsculpture, no distinct punctation. Metapleura shining. Petiole about 1.25 times length of first tergite, this tergite somewhat longer than broad. Pygidial area over 1.5 times as long as broad. Second recurrent vein of fore wings interstitial.

Pubescence of head and thorax silvery, on face mostly appressed, dense on mesopleura. Pubescence of gaster short, yellowish; pygidial area with golden-brown short and appressed pubescence and a few long erect hairs.

Male. — Similar to female. Length 4—5 mm. Apical half of foreside of fore and mid femora also yellowish-brown. Apical margin of tergite 1, all of tergites 2 and 3 red with an indistinct brownish band before hind margin, hind margins of following tergites reddish transparant; sternites 2—4 red.

Antennae long and slender, segments 8—12 about twice as long as broad, segment 13 over twice as long as broad. Segments 4—10 or 4—11 with indistinct, dull, linear tyloidea. Punctures of scutum stronger and more densely placed, partly weakly rugoso-punctate. Back of propodeum more coarsely and more irregularly reticulate than in female. Petiole about 1⅓ times length of first tergite. In one of the males the pubescence of the face is faintly yellowish.

Peru: 1 ♀, holotype, Loreto, Pucallpa, Lake Yarina Cocha, 180 m, 26—27 Aug. 1971, 3 ♂, allotype and paratypes, same locality, 25—27 Aug. 1971, C. and M. Vardy (BM). Further paratypes: 2 ♂, "Peru" (NMW); 2 ♀, Loreto, San Antonio, 13 Aug. 1965, Malaise trap, J. C. Hitchcock Jr. (USNM); 1 ♂, Puerto Bermudez, Rio Pichis, 12—19 July 1920, Cornell U. Lot 569, Sub 256 (CU); 1 ♀, 25 mi west San Jorge, 4 Oct. 1954; 1 ♂, Yurac, 67 mi east Tingo Maria, 350 m, 4 Oct. 1954, E. I. Schlinger and E. S. Ross (CAS); 1 ♀, 15 mi northeast Tingo Maria, 700 m, 11 Nov. 1954, E. I. Schlinger and E. S. Ross (UCD).

Bolivia: 1 ♀, paratype, near mouth Rio Mapiri, Sept., Mulford Bio Expl. 1921—22 (USNM).

Brazil: 1 ♀, "Brasil, Smith coll. pres. by Mrs. Farren White 99—303"(BM); 1 ♀, Acre, Cruziero do Sul, Nov. 1963, M. Alvarenga (UFP). Paratypes.

Colombia: 1 ♂, paratype, Caqueta, Rio Orteguaza nr. Rio Peneya, 14—18 Jan. 1969, Duckworth and Dietz (USNM).

Ecuador: Napo, 1 ♂, paratype, Coca on Rio Napo, May 1965, L. E. Peña (AMNH); 1 ♂, paratype, 42 km west Santa Cecilia, 16 May 1975, Ashley Gurney (USNM); 1 ♂, Coca, Napo River, 250 m, 22—30 April 1965, L. Peña (CNC); the scutum of this latter male is much less coarsely punctate than in the other males, with distinct interstices between the punctures.

P. marthae is closely related to *P. townsendi*, which is also found in Peru, and which has the same dull, indistinct sculpture of the mesopleura. It differs from the

latter species in the longer petiole and the coarser reticulation of the back of the propodeum. The gaster of the female is more red.

P. marthae is named for Mrs. Martha Vardy, one of the collectors of the type material.

Pluto metanus sp. nov.
(fig. 38)

Female. — Very close to *P. marthae* but differing in the following details. Length about 5 mm. Bases of fore and mid tibiae and mid tarsal segments 1—4 yellowish-white. Gaster black, hind margins of tergites and of sternites reddish.

Median part of clypeal margin less than half total width of clypeus, slightly but distinctly emarginate, medially not protruding, with small lateral teeth (fig. 38).

Male. — Similar to female. Fore tibiae and tarsi more orange. Antennal segments 4—11 with distinct, shining, fine linear tyloidea. Vertex behind ocelli shining. Scutum with less tendency to rugosity than in the male of *P. marthae*.

Colombia: 3 ♀, holotype and paratypes, 2 ♂, allotype and paratype, Meta, Rio Duda, 8—12 March 1976, M. Cooper (BM).

This form may have to be ranked as a darker subspecies of *P. marthae*, although the clypeal margins of the females seem to be slightly different. Further studies on larger series are needed to assess whether these differences fall within the range of specific variation.

Group of *nitens*

Pluto nitens sp. nov.
(fig. 39)

Female. — Length about 7 mm. Black. Mandibles pale yellowish-brown with dark tips, labrum dark reddish. Underside of flagellum brown or reddish-brown. Pronotal tubercles brown. Tegulae yellowish-brown. Knees, tibiae and tarsi of fore legs yellowish, underside of tibiae slightly darkened. Apices of mid tibiae and tarsal segments 1—4 yellowish. Basal 1/3 of hind tibiae reddish-brown, tarsi brown but greater part of basitarsi and apices of segments 2—5 brownish-yellow. Veins of wings dark brown. Hind margins of gastral segments reddish transparent.

Median part of clypeal margin depressed, shining, very weakly emarginate with indistinct lateral angles (fig. 39); disk convex, distinctly separated from depressed margin, upper part of disk densely punctate, lower 1/3 shining, impunctate. Frons medially with fine hair-bearing punctures, upper part and vertex shining, sparsely punctate. POD smaller than OOD. Occipital carina fine, intercarinal space narrow. Antennae relatively slender, gradually widening towards apex, segments 10—11 in frontal view longer than wide, segment 12 twice as long as broad.

Lateral pronotal angles almost rectangular. Scutum and scutellum shining,

almost imperceptibly reticulate alutaceous, sparsely punctate. Prescutal sutures distinct on anterior 1/3. Propodeal enclosure shining, with long oblique carinae and elongate pentagonal median area. Back of propodeum dull, with long parallel carinae, lower part reticulato-carinate. Mesopleura and hypo-epimeral area smooth and shining, sparsely minutely punctate, mesosternum more densely so. Anterior oblique suture narrow, crenulate. Second recurrent vein of fore wings ending in third submarginal cell, almost interstitial. Petiole about as longer as first tergite, this tergite as long as broad. Pygidial area about 1.75 times as long as broad.

Face with silvery appressed pubescence and many long, erect, silvery hairs. Pronotal collar with some appressed silvery pubescence and many long erect hairs. Vertex, scutum and scutellum greyish-brown or brown pubescent, pygidial area and sides of last tergite golden-brown appressed pubescent and also with long erect brown hairs, rest of body whitish pubescent.

Male. — Similar. Length 5-6 mm. Median part of clypeal margin slightly protruding, margin narrowly depressed, shining. Antennae long and slender, segments 3—12 about 1.5 times as long as broad, segment 13 over twice as long as broad, segments 4—12 with fine linear tyloides, as long as segments, shorter on segments 11 and 12 or on segment 12, segment 13 sometimes with a short tyloides. Petiole as long as or slightly longer than tergite 1, this tergite longer than broad. Back of propodeum coarsely reticulate, upper part with some parallel oblique carinae. Hind basitarsi largely brown, sometimes basitarsus yellowish-red. Face silvery pubescent, sometimes golden, pubescence of head and thorax golden-brown.

Brazil: Goiás: 1 ♀, holotype, 1 ♂, allotype, 2 ♀ and 1 ♂, paratypes, Jataí, Nov. 1972, F. M. Oliveira (HT); 1 ♀, paratype, same locality and date, F. M. Oliveira (CNC). Further paratypes from Brazil: Mato Grosso: 2 ♀ and 2 ♂, Itaum, March 1974, M. Alvarenga (HT). Minas Gerais: 1 ♂, Vicoss, 1930, E. J. Hambleton (CU); 1 ♀ and 1 ♂, Brazopolis, Dec. 1961, 4 ♂, Passos, 1—8 March and 24 Nov. 1962, 16—21 Oct. and 18—23 Nov. 1963, 1 ♀, Pratápolis, 5 Nov. 1963, 1 ♂, Araxa, 29 Nov. 1965, all collected by C. Elias (UCD). São Paulo: 1 ♀, São Paulo, 18 March 1967, V. N. Alin (UCD); 1 ♀, São Paulo, 12 Febr. 1968, V. N. Alin (USNM); 1 ♀, Ribeirão Prêto, 1 July 1968, G. E. Bohart (UCD).

Two further females from Minas Gerais have brownish-orange fore and mid tarsi and underside of flagellum. Their clypeus seems to be more flat: 1 ♀, Perdizes, 8 April 1965, C. Elias; 1 ♀, Araxa, 22 March 1965, C. Elias (UFP). They have not been labelled as paratypes.

The undermentioned specimens are all paratypes.

Argentina: Misiones: 1 ♂, Iguazú, 30 Jan.—13 March 1945, Hayward-Willink-Golbach (IML).

Bolivia: Cochabamba: 1 ♂, Chapare, Cesar Zama, Jan. 1975, Martinez, 2 ♂, Chapare, Chimore, Jan. 1972, M. Fritz (MF); 1 ♂, "Bolivia"(NMW).

Colombia: 1 ♂, Vaupés, Mitu, 11 May 1974, M. Cooper (BM). The hind tarsi of this male are brownish-yellow. No antennae.

Ecuador: Napo Prov.: 1 ♀ and 1 ♂, Tena, 17 Febr. and 24 March 1923, F. X.

Williams (BISH); 2 ♀, Coca, May 1965, Luis Peña (HT and MCZ); 3 ♀ and 8 ♂, Limoncocha, 250 m, 15—28 June 1976, S. and J. Peck (CNC); 1 ♂, Limoncocha, 9 June 1977, D. L. Vincent (USNM); 1 ♀, Dureno Aguarico, 76° 31° west, 00° 4° south, 29 May 1963, L. Peña (MCZ); 1 ♀, Pompeya, May 1965, Peña (MCZ).

Paraguay: 1 ♀, Pirareta, Jan. 1972, L. Peña (MF).

Peru: Pasco Dep.: 1 ♀, Puerto Bermudez, Rio Pichis, 12—19 July 1920, Cornell Univ. Exped., Lot 596, Sub. 256 (CU). Cuzco Dep.: 2 ♀, Quincemil, 15—30 Oct. 1962, Peña (CNC); 1 ♀ and 1 ♂, Quincemil, 750 m, 1—16 Nov. 1962 and 16—31 Oct. 1962, L. Peña (MCZ). Huánuco Dep.: 1 ♀ and 1 ♂, Monson Valley, Tingo Maria, 2 Nov. and 21 Oct. 1954, 1 ♂, Yurac, 67 mi east of Tingo Maria, 16 Nov. 1954, E. I. Schlinger and E. S. Ross (CAS); 1 ♀, Tingo Maria, 20—27 Jan. 1968, A. Garcia and C. Porter (MCZ). Madre de Dios Dep.: 1 ♂, Manú, Oct. 1962, Peña (MCZ).

Surinam: 1 ♀, Mapane Area, Camp 8, LBB, m.k. II, 30 May 1963, J. van der Vecht (ML).

Venezuela: 1 ♀, San Esteban, Falcon, 16 Jan. 1940, P. J. Anduze (CU).

The pubescence of the face of the males from Ecuador and Peru is golden, except in the male from Manu (Peru), and the pubescence of the thorax is somewhat golden-brown. The face of the females from these countries is very pale golden.

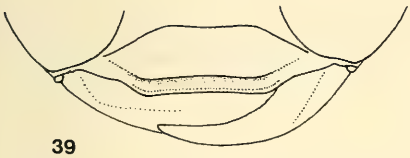
The specific name refers to the shining mesopleura.

Pluto duckei sp. nov.
(fig. 40)

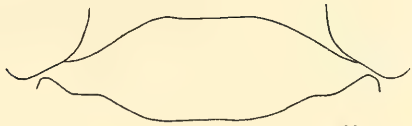
Female. — Length about 7.5 mm. Black. Mandibles and labrum orange-red; underside of flagellum reddish-brown. Pronotal tubercles, tegulae, fore and mid tibiae and tarsi yellowish-red. Basal 2/5 of hind tibiae and tarsal segments 1—4 yellowish-red. Hind margin of first tergite, all of second tergite and basal half and hind margin of third tergite, hind margins of tergites 4—5, sternites 2—3 entirely and hind margins of sternites 4—5 reddish. Veins of wings dark brown.

Median part of clypeal margin about half total width of margin, slightly emarginate, no distinct lateral teeth (fig. 40). Anterior third of clypeal disk shining, impunctate, somewhat raised, narrow margin depressed. Frons and vertex shining, frons sparsely finely punctate. POD distinctly smaller than OOD. Occipital carina somewhat thickened ventro-laterally, low and indistinct near hypostomal carina, intercarinal space very narrow. Antennae gradually widening towards apex, last segment about 1.75 times as long as broad.

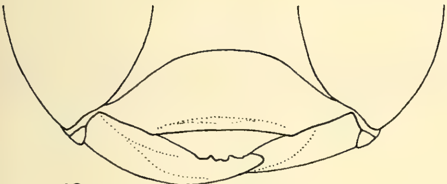
Lateral pronotal angles obtuse. Scutum and scutellum shining, very finely reticulate alutaceous, sparsely finely punctate. Propodeal enclosure shining, large median diamond-shaped area, back of propodeum with widely placed oblique parallel carinae, below somewhat reticulate. Mesopleura and hypo-epimeral area shining, indistinctly alutaceous, mesopleura with very minute, hair-bearing punctures. Mesosternum almost dull, densely very finely punctate. Anterior plate of mesepisternum shining, oblique suture with few transverse carinae. Second



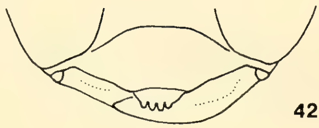
39



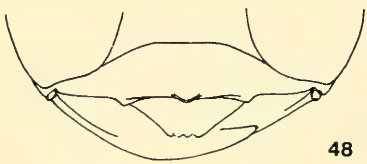
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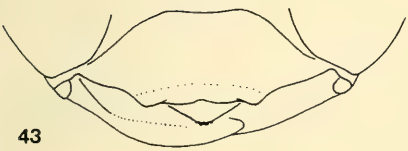
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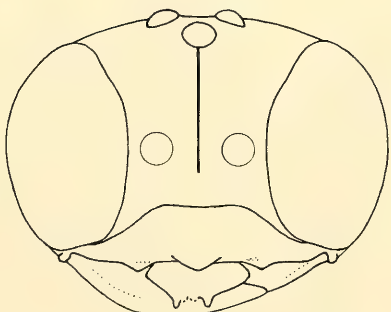
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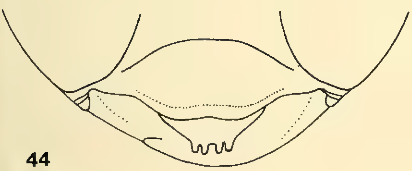
48



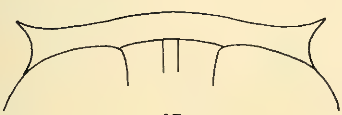
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45



46

Fig. 39. *Pluto nitens* sp. n., ♀, holotype, clypeus. Fig. 40. *P. duckei* sp. n., ♀, holotype, clypeus. Fig. 41. *P. obscurus* sp. n., ♀, holotype, clypeus. Fig. 42. *P. menkei* sp. n., ♀, holotype, clypeus. Fig. 43. *P. zonatus* sp. n., ♀, paratype, clypeus. Figs. 44—45. *P. occipitalis* sp. n., ♀ holotype; 44, clypeus; 45, pronotum. Fig. 46. *P. spinicollis* sp. n., ♀, pronotum. Fig. 47. *P. trilobatus* sp. n., ♀, paratype, head in frontal aspect. Fig. 48. *P. microlobatus* sp. n., ♀, holotype, clypeus.

recurrent vein of fore wings about interstitial. Petiole as long as first tergite, this tergite as long as broad. Pygidial area about twice as long as broad.

Face, tempora and pronotal collar with dense, mostly appressed, silvery pubescence. Vertex, scutum and scutellum brownish pubescent. Pygidial area with dark brown, backwards directed bristles. Rest of body whitish pubescent.

Male unknown.

Brazil: 1 ♀, holotype, Pará, 25 Nov. 1899, Ducke (NMW); 1 ♀, paratype, Pará, Baker (UCD).

This female differs from the female of *P. nitens* mainly in the colour of the gaster and in the microsculpture of the thorax. The low ventral part of the occipital carina and the red second tergite are characteristic. Also close to *P. zonatus* which has shorter antennal segments, different clypeal margin, less shining mesopleura and shorter petiole.

Pluto obscurus sp. nov.
(fig. 41)

Female. — Length about 9.5 mm. Black. Mandibles dark reddish. Underside of last antennal segment, foreside of fore tibiae and all of fore tarsi, apices of mid tibiae and mid basitarsus reddish-brown. Hind tibiae and tarsi entirely dark brown, hind tibial spurs reddish-brown.

Anterior margin of clypeus almost straight, no lateral teeth or angles, shining margin very narrowly depressed (fig. 41). Disk of clypeus entirely with large superficial punctures. Frons and vertex shining, sparsely punctate, a large low shining tubercle near oculi, frons raised around anterior ocellus. POD somewhat smaller than OOD. Intercarinal space narrow. Antennae slightly thickened towards apex, third segment about 3.5 times as long as broad, following segments about 1.5 times.

Lateral pronotal angles somewhat sharp, little protruding. Scutum and scutellum shining, very finely reticulate alutaceous, sparsely punctate. Propodeal enclosure shining, with few oblique carinae. Back of propodeum somewhat shining, coarsely reticulate, dorso-lateral parts with some oblique carinae. Hypoepimeral area and mesopleura shining, very finely alutaceous, mesopleura sparsely very finely punctate. Anterior plate of mesepisternum dull, with a few rugae, oblique suture crenulate. Mesosternum densely superficially finely punctate. Petiole about 4/5 length of first tergite, this tergite slightly longer than broad. Pygidial area about 1.5 times as long as broad. Second recurrent vein of fore wings ending in third submarginal cell. Posterior side of hind tibiae with longitudinal rows of short pale brownish transparent thorns, each ending in a very short hair.

Face with silvery appressed pubescence and conspicuous long erect brown hairs. Tempora and pronotal collar silvery, appressed, pubescent. Hind tibiae on inner side at base and apex and inner side of hind basitarsi with conspicuous golden pubescence. Pygidial area with dark brown pubescence. Rest of body with greyish-brown hairs.

Male unknown.

Argentina: 1 ♀, holotype, Misiones, Pto. Esperanza, Dec. 1976, M. Fritz (MF).

P. obscurus is apparently close to *P. nitens,* but is distinctly larger and darker, the frons is distinctly raised, the thorax is very finely alutaceous, the antennal segments are much longer and the long hairs intermixed with the appressed facial pubescence are brown.

The specific name refers to the dark legs and the dark hairs of the clypeus.

Pluto zonatus sp. nov.
(fig. 43)

Female. — Length 7 mm. Black. Mandibles dark reddish. Dorsal side of flagellum brown, underside orange. Pronotal tubercles dark brown. Tegulae yellowish-red. Fore and mid tibiae and tarsi, basal 1/4 of hind tibiae and hind tarsal segments 1—4 brownish-yellow or yellowish-red. Hind margins of first tergite distinctly red, all or 2/3 of second tergite and sternite red. Veins of wings brown.

Median part of clypeal margin with three shallow emarginations, this part about half total width of clypeal margin (fig. 43). Basal 2/3 of clypeal disk densely strongly punctate, anterior 1/3 shining, almost impunctate. Frons and vertex shining, a low elongate tubercle near the eyes; frons on either side of anterior ocellus raised and dull, indistinctly punctate. POD nearly as large as OOD. Intercarinal space narrow. Antennae thick, segments 10—11 broader than long, last segment about 1.5 times as long as broad.

Lateral pronotal angles rectangular, anterior carina projecting laterally as a minute tooth. Scutum and scutellum shining, sparsely finely punctate. Propodeum shining, enclosure with large median pentagonal area, back coarsely reticulato-carinate, dorso-lateral carinae close and parallel. Mesopleura and hypo-epimeral area shining, indistinctly punctate, lower part of mesopleura slightly alutaceous. Anterior oblique suture crenulate. Mesosternum somewhat reticulate alutaceous, sparsely distinctly punctate. Second recurrent vein of fore wings ending in third submarginal cell. Petiole about 2/3 length of first tergite, this tergite somewhat longer than broad. Pygidial area about 1 ⅔ times as long as broad.

Face and tempora pale golden pubescent, vertex, scutum and scutellum brownish-grey pubescent, pygidial area with appressed golden-brown pubescence and long backward directed brownish hairs, rest of body whitish pubescent.

Male unknown.

Brazil: 1 ♀, holotype, São Paulo (S.P.), 28 Jan. 1965, V.N. Alin (UCD); 1 ♀, paratype, São Paulo, Villa Americana, Febr. 1924, F. X. Williams (BISH).

The specific name refers to the red band of the gaster.

Pluto simplicicollis sp. nov.

Female. — Similar to *P. zonatus,* but smaller, length about 6.5 mm. Labrum reddish. Gaster black with reddish transparent hind margins of tergites. Petiole

nearly as long as first tergite. Frons near anterior ocellus and lower part of mesopleura more shining.

Male unknown.

Brazil: 1 ♀, holotype, São Paulo, Campinas, March 1924, F. X. Williams (BISH).

The petiole being distinctly longer than in *P. zonatus,* I provisionally consider this form a distinct species. The colour of the gaster may be subject to variation.

The specific name refers to the lateral pronotal angles which are not projecting.

Pluto menkei sp. nov.
(fig. 42)

Female. — Length about 5 mm. Head and thorax black. Mandibles yellow with dark tips. Underside of flagellum reddish-brown. Pronotal tubecles whitish, tegulae yellowish-red. Apices of fore and mid tibiae and base of hind tibiae yellowish. Fore tarsi and mid basitarsi whitish, rest of mid tarsi yellowish-brown; hind tarsi dark brown, apices of segments yellowish-brown. Gaster black, except for hind margin of tergite 1, all of tergite 2, base of tergite 3, all of sternite 2 and base of sternite 3, which are red. Veins of wings dark brown or black.

Median part of clypeal margin weakly emarginate, about 1/3 of total width of margin, no distinct lateral teeth (fig. 42). Disk of clypeus densely punctate, with narrow shining margin. Frons medially finely punctate, laterally sparsely punctate, a small shining raised area along eyes. Vertex and interocular space shining, very sparsely punctate. POD somewhat smaller than OOD. Intercarinal space narrow, occipital carina distinct. Antennal segments 10—11 in lateral view about as long as broad.

Lateral pronotal angles sharp in dorsal view but hardly toothlike projecting. Scutum shining, sparsely punctate. Scutellum indistinctly alutaceous, sparsely punctate. Propodeal enclosure shining with large median area; back of propodeum somewhat dull, rather coarsely reticulato-carinate, carinae on upper part oblique, parallel. Mesopleura shining, mostly sparsely finely punctate, a few larger punctures intermixed. Hypo-epimeral area shining, indistinctly punctate. Anterior plate of mesepisternum somewhat dull. Anterior part of mesosternum densely punctate. Petiole about 2/3 length of first tergite, this tergite somewhat longer than broad. Pygidial area almost twice as long as broad. Second recurrent vein of fore wings interstitial.

Pubescence of face and of pronotal collar silvery, mostly appressed, of vertex and dorsal side of thorax greyish-brown, longer, of last gastral segment golden-brown, of rest of body whitish.

Male unknown (cf. remarks *P. incarnatus* ♂).

Venezuela: 1 ♀, holotype, Aragua, 2 km north of Ocumare de la Costa, 21—22 June 1976, A. S. Menke and D. Vincent (USNM).

This small species may be closely related to *P. zonatus* but the clypeal margin,

the length of the antennal segments, the colour of the facial pubescence and that of the hind tarsi are different.

Pluto occipitalis sp. nov.
(figs. 44—45)

Female. — Length about 6 mm. Black. Mandibles yellowish-red, apex of clypeus and labrum reddish. Underside of flagellum yellowish-brown. Pronotal tubercles yellowish-white. Fore and mid tibiae and tarsi brownish-yellow, basitarsi paler. Basal third of hind tibiae and hind basitarsus straw-yellow, segments 2—4 of hind tarsi pale brown, last segment dark brown. Hind margins of gastral segments transparent. Veins of wings black.

Median third of clypeal margin slightly protruding and emarginate (fig. 44). Frons dull, raised on either side of anterior ocellus; vertex shining, not distinctly punctate, a low tubercle along the eyes. POD about equal to OOD. Lateral and ventral parts of occipital carina extraordinarily high, in dorsal view as high as pubescence of tempora. Antennal segments 10—11 about quadrate.

Anterior dorsal carina of pronotum high, laterally protruding as a sharp tooth (fig. 45). Scutum and scutellum somewhat shining, very finely reticulate alutaceous, sparsely punctate. Prescutal sutures about as long as 3/4 of scutum, indistinct. Propodeal enclosure shining, with few lateral carinae and large pentagonal median area. Back of propodeum finely coriaceous and coarsely reticulato-carinate. Mesopleura and hypo-epimeral area shining, not distinctly punctate. Anterior oblique suture narrow. Mesosternum densely finely punctate. Second recurrent vein of fore wings ending in third submarginal cell. Petiole as long as first tergite, this tergite as long as broad. Pygidial area about 1.5 times as long as broad. Back of hind tibiae with relatively long yellowish-brown thorns.

Pubescence of face silvery, mostly appressed; pronotal collar silvery pubescent, pubescence of vertex, scutum and scutellum greyish-brown, of pygidial area brown, short and appressed. the latter area also with long brown hairs. Rest of body with whitish hairs.

Male unknown.

Peru: 1 ♀, holotype, Loreto, San Antonio, 13 Aug. 1965, Malaise trap, J. C. Hitchcock Jr. (USNM).

P. occipitalis is easily distinguished by the smooth mesopleura and hypo-epimeral area, the high occipital carina and the sharp lateral pronotal angles. The specific name refers to the unusually high occipital carina.

Pluto spinicollis sp. nov.
(fig. 46)

Female. — Length about 6.5 mm. Black. Clypeal margin and labrum dark reddish. Mandibles brownish-yellow with reddish tips. Underside of flagellum orange-brown. Pronotal tubercles yellow. Fore and mid tibiae and tarsi yellow,

back of mid tibiae blackish, base of tibiae and entire basitarsi whitish. Base of hind tibiae and hind tarsi except for last segment yellowish. Petiole dark brown or black. Tergites 1—3 and sternites 2—3 red, following tergites and sternites with reddish transparent hind margins. Veins of wings dark brown.

Clypeal margin very slightly emarginate, almost straight (cf. *duckei*, fig. 40). Disk of clypeus dull. Frons densely finely punctate. Vertex shining, sparsely punctate. Intercarinal space narrower than first basitarsus. Antennae short, clavate, segments 9—11 about quadrate, last segment about 1.5 times as long as broad.

Lateral pronotal angles, in dorsal view, with a small sharp tooth (fig. 46). Scutum and mesopleura shining, almost imperceptibly reticulate alutaceous and sparsely very finely punctate. Hypo-epimeral area shining, indistinctly sparsely punctate. Scutellum dull, finely reticulate alutaceous, with sparse distinct punctures. Metanotum dull, densely punctate. Enclosed area of propodeum shining, with oblique lateral carinae and pentagonal central area. Back of propodeum almost shining, coarsely reticulate, dorso-lateral carinae about parallel. Anterior oblique suture narrow, indistinctly crenulate, widened upper part smooth. Anterior plate of mesepisternum dull, indistinctly sculptured. Scond recurrent vein of fore wings interstitial. Petiole little over half length of first tergite, this tergite about as long as broad. Pygidial area less than twice as long as broad.

Pubescence of face, frons and tempora silvery, below antennae mostly appressed but also with long erect hairs. Pronotal collar with appressed silvery pubescence. Last tergite with golden-brown hairs, longer and erect on sides; short, dense and appressed on pygidial area; rest of body yellowish-grey pubescent.

Male unknown.

Brazil: Roraima, 2 ♀, holotype and paratype, Surumú, Sept. 1966, M. Alvarenga (HT); 1 ♀, paratype, same locality and same date, M. Alvarenga (UCD).

Panama: 1 ♀, paratype, Bella Vista, 6 July 1924, N. Banks (MCZ). In this female the posterior half of the third tergite is darkened.

The shape of the pronotum and the red tergites easily distinguish *P. spinicollis* from other *Pluto* with shining mesopleura.

The specific name refers to the lateral teeth of the pronotal collar.

Pluto trilobatus sp. nov.
(fig. 47)

Female. — Length about 6.5 mm. Black, gaster blackish-brown. Mandibles yellowish or reddish-yellow with dark reddish tips; labrum reddish. Underside of flagellum dark yellowish-brown. Pronotal tubercles dark brown to black. Trochanters of fore legs, fore tibiae, foreside of mid tibiae and basal fourth of hind tibiae yellowish-brown. Fore and mid basitarsi yellowish-white or brownish-yellow, segments 2—5 dark brown. Hind tibial spurs whitish, hind tarsi brown. Veins of wings including stigma dark brown.

Clypeal apex with distinct small lateral teeth, distance between these teeth about half total width of margin; clypeal margin medially somewhat raised and

protruding (fig. 47). Disk of clypeus dull. Frons and vertex smooth and shining, frons superficially finely punctate, vertex almost impunctate. POD distinctly smaller than OOD. Occipital carina not continued to ventral carina, distance from ventral carina and from hypostomal carina about length of first basitarsus. Antennae somewhat clavate, segments 10—11 longer than broad, segment 12 twice as long as broad.

Lateral pronotal angles obtuse. Scutum and scutellum dull, finely reticulate alutaceous and very finely punctate, interstices a few times size of punctures. Prescutal sutures indistinctly continued to hind margin of scutum. Scutellar suture except for distinct median longitudinal carina relatively indistinctly crenulate. Propodeum including enclosure dull, very finely coriaceous, enclosure with large pentagonal median area, dorsal half of back with oblique parallel carinae, lower part reticulato-carinate. Mesopleura and hypo-epimeral area smooth and shining, very indistinctly punctate. Mesosternum indistinctly finely punctate. Anterior oblique suture indistinctly crenulate. Second recurrent vein of fore wings interstitial. Mid tibiae with about seven slender thorns which are about as long as 4/5 width of tibiae. Petiole about length of first tergite, laterally flattened with distinct upper and lower carina. First tergite longer than broad. Pygidial area nearly triangular, about 1 ⅓ times as long as broad, sometimes less.

Face densely silvery, mostly appressed, pubescent and with long erect hairs. Tempora with short silvery pubescence. Vertex, scutum and scutellum with greyish-brown hairs. Pygidial area with dense golden-brown backwards directed pubescence. Rest of body greyish pubescent.

Male. — Similar to female, but underside of antennae pale yellowish-brown. Clypeal margin not raised, with three indistinct teeth. Antennae slender, most segments about twice as long as broad, segments 5—8 with linear tyloides, as long as segment, in lateral view distinctly roundly raised in the middle; segment 4 with long narrow fine tyloides, segment 9 with very short fine tyloides. Petiole nearly 1.5 times as long as first tergite, this tergite about 1.5 times as long as broad.

Ecuador: Napo Prov., Limoncocha on Rio Napo, 1 ♀, holotype and 2 ♂, allotype and paratype, 250 m, 15—28 June 1976, S. and J. Peck (CNC); 2 ♀ and 1 ♂, paratypes, 9 June 1977, D. L. Vincent (USNM); 1 ♀, paratype, 22 July 1974, Malaise trap (FSC).

Peru: 1 ♀, paratype, Madre de Dios, Avispas, 400 m, 10—30 Sept. 1962, L. Peña (MCZ).

Surinam: 1 ♀, paratype, Kabalebo River, Avanavero Falls, 5—12 April 1971, W. Surinam Exp., D. C. Geijskes (ML).

The slightly raised and protruding median part of the clypeal disk of the female, the small number of tyloidea of the male and the incomplete occipital carina in both sexes of *P. trilobatus* are characteristic. The specific name refers to the trilobate or tridentate clypeal margin of the female.

Pluto sp. aff. **trilobatus**
(fig. 48)

A female from Peru is very similar to *P. trilobatus,* but it is somewhat smaller and differs also in the following details.

Length about 6 mm. Median part of clypeal margin weakly emarginate, small lateral teeth, distance between these teeth about half total width of clypeal margin, in the middle a very small protruding tooth (fig. 48). Occipital carina incomplete, distance from ventral median carina about length of first basitarsus and from hypostomal carina about half this length. Pygidial area about 1.5 times as long as broad.

Peru: 1 ♀, Avispas, 30 m, nr. Marcapata, 27—30 Oct. 1962, Luis Peña (HT). As the median clypeal tooth is smaller than in the preceding form and as the pygidial area seems to be narrower, I had originally considered this female to belong to a distinct species. Later I could examine another female from Avispas in Peru, which is identical with the holotype of *P. trilobatus.* Therefore I do not exclude the possibility that the first mentioned female is an aberrant form of *P. trilobatus.*

Pluto rufanalis sp. nov.

Female. — Length about 5 mm. Black. Mandibles, labrum and underside of flagellum yellowish-red, dorsal side of antennae brown. Pronotal tubercles whitish. Fore and mid tibiae yellowish, first tarsal segments whitish, outer side of mid tibiae brownish. Basal third of hind tibiae and tarsal segments 1—4 yellowish-white. Gaster black, hind margins of tergites and last segment largely or entirely reddish. Veins of wings dark brown.

Median part of clypeal margin straight, narrow margin depressed and shining; small lateral teeth, distance between these teeth less than half total width of margin. Disk densely punctate. Frons densely superficially and finely punctate. Vertex shining, almost impunctate. POD about equal to OOD. Intercarinal space much narrower than first basitarsus. Antennae clavate, segments 10—11 shorter than broad.

Lateral pronotal angles rectangular. Scutum and scutellum shining, sparsely punctate. Propodeal enclosure shining, large median area. Back of propodeum indistinctly coriaceous, coarsely reticulato-carinate. Mesopleura and mesosternum shining, slightly reticulate alutaceous, sparsely indistinctly punctate. Hypo-epimeral area smooth. Anterior plate of mesepisternum dull, oblique suture crenulate. Second recurrent vein of fore wings interstitial. Petiole nearly as long as first tergite, this tergite somewhat longer than broad. Pygidial area about 1.5 times as long as broad.

Pubescence of face yellowish-silvery, mostly appressed, of pronotal collar silvery, appressed, of pygidial area golden-brown, of rest of body whitish or greyish.

Male. — Length about 4.5—5 mm. Colour as in female but hind tarsi largely pale brown.

Antennae slender, segments about 1.5 times as long as broad, no distinct

tyloidea, Mesopleura and hypo-epimeral area shining, mesopleura sparsely finely punctate. Gaster slender, petiole about as long as first tergite, this tergite over 1.5 times as long as broad. Face silvery.

Peru: 4 ♀, holotype and paratypes and 2 ♂, allotype and paratype, Chancay, River valley, 15 March 1951, Ross and Mickelbacher (CAS); 1 ♀, paratype, Piura, Ostendorf (ZMB); 26♂, paratypes, Pariñas Vall., 7—8 April, Mrs. Frisell (MCZ).

P. rufanalis is closely related to *P. nitens,* but apart from the smaller size the female differs in the yellowish-white pronotal tubercles and hind tarsi, the male in the indistinct or absent tyloidea and the very slender gaster. It also much resembles *P. araguensis* which, however, has sharp pronotal angles and more densely punctate mesopleura.

The specific name refers to the reddish apex of the gaster.

Pluto araguensis sp. nov.
(figs. 49—50)

Female. — Length about 5—6 mm. Black; mandibles yellowish-red with darker tips, labrum reddish. Underside of flagellum reddish-brown. Fore and mid tibiae and tarsi, base of hind tibiae and hind tarsal segments 1—4 yellowish, outer side of fore and mid tibiae with narrow whitish streak. Pronotal tubercles whitish, tegulae reddish-brown. Hind margins of gastral segments reddish transparent.

Median part of clypeal margin slightly emarginate, distance between the very obtuse angles about half total width of clypeal margin (fig. 49). Frons densely finely punctate, laterally with large, slightly swollen smooth area. Vertex shining, sparsely punctate. POD somewhat smaller than OOD. Intercarinal space about half width first basitarsus. Antennal segments about as long as broad.

Lateral pronotal angles very sharp (fig. 50). Scutum and scutellum almost shining, weakly reticulate alutaceous, distinctly punctate, interstices mostly a few times size of punctures. Propodeal enclosure shining, with large pentagonal median area. Back of propodeum reticulato-carinate, dorso-lateral carinae parallel. Mesopleura, mesosternum and hypo-epimeral area shining, very finely alutaceous, mesopleura regularly finely punctate, interstices a few times size of punctures, hypo-epimeral area indistinctly punctate. Anterior plate of mesepisternum dull, oblique suture narrow, indistinctly crenulate. Petiole about 2/3 length of first tergite. Pygidial area about 1.5 times as long as broad. Second recurrent vein of fore wings interstitial.

Pubescence of face and pronotal collar silvery, mostly appressed, of pygidial area dark brown, of rest of body whitish or greyish.

Male. — Length about 5—5.5 mm. Underside of flagellum largely brown. Fore and mid femora and tibiae and basal 1/3 of hind tibiae yellowish-red, fore and mid tarsi yellowish-white, hind tarsi pale yellowish-brown or yellowish-white. Rest of body of same colour as in female.

Median part of clypeal margin slightly protruding, about 1/4 of total width of margin, disk shining, densely punctate. Antennae slender, segments 10—12 about 1.25 times as long as broad, tyloidea indistinct.

Lateral pronotal angles about rectangular. Mesopleura shining, sparsely punctate; hypo-epimeral area shining, indistinctly punctate. Back of propodeum coarsely reticulato-carinate, dorso-laterally with oblique parallel carinae; in the allotype these carinae are not distinctly parallel. Petiole about as long as first tergite, this tergite about 1.5 times as long as broad. Pubescence as in female.

Genitalia reddish-brown.

Venezuela: Aragua, 2 km north Ocumare de la Costa, 3 ♀, holotype and paratypes, 1 ♂, allotype, 21—22 June 1976, A. S. Menke and D. Vincent (USNM); 1 ♂, paratype, Puerto Caballo, 12 Febr. 1940, 1 ♂, paratype, San Esteban, Jan. 1940 (CU).

P. araguensis, at least the female, seems to be very closely related to *P. spinicollis*, although the pronotal angles are projecting laterally instead of obliquely forwards. Its gaster is entirely black, that of *P. spinicollis* partly red. The pronotal angles of the male of *P. araguensis* are less sharp than in the female and the colour of the femora is much paler. However, as one of the males has been taken together with three females they may safely be regarded as the same species.

Pluto incarinatus sp. nov.

Male. — Length about 5.5 mm. Head and thorax black; mandibles pale yellow with dark reddish tips, labrum black, antennae black, underside of last antennal segment reddish-brown. Pronotal tubercles whitish; tegulae light brown, wings somewhat smoky, veins dark brown. Femora black. Fore tibiae almost entirely and greater part of underside of mid tibiae yellowish-brown, rest of tibiae dark brown; bases of mid and hind tibiae yellowish-white. Fore and mid tarsi whitish, hind tarsal segments brown with paler apices. Tibial spurs of hind legs whitish. Apical half of first tergite, all of second tergite and all of second sternite red, rest of gaster black with bluish reflection.

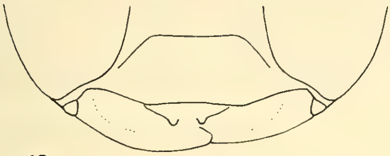
Protruding median part of clypeal margin about 1/4 of total width, weakly emarginate. Intercarinal space probably narrow. Median part of frons densely punctate, vertex and interocellar area shining, sparsely punctate, tempora dull. POD about equal to OOD. Antennal segments 10—12 nearly 1.5 times as long as broad, segment 13 over twice as long as broad. No tyloidea.

Lateral pronotal angles sharp, in dorsal aspect. Scutum shining, very finely reticulate alutaceous with widespread distinct punctures. Scutellum almost shining, sparsely finely punctate, anterior suture coarsely crenulate. Back of propodeum shining, coarsely reticulato-carinate; enclosure with shining median area. Hypo-epimeral area shining with a few minute hair-bearing punctures. Mesopleura and mesosternum shining, regularly finely punctate, interstices about two to four times size of punctures. Mesosternum very finely reticulate alutaceous. Anterior plate of mesepisternum dull, finely striate; oblique suture narrow, crenulate. Legs stoutly built. Petiole about as long as first tergite, this tergite about 1.5 times as long as broad. Second recurrent vein of fore wings about interstitial.

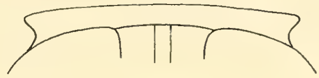
Pubescence of face pale golden to silvery, mostly appressed. Tempora, pronotal

collar and metanotum pale golden pubescent, scutum brownish, rest of thorax pale golden, propodeum scarcely pubescent. Gaster greyish-golden pubescent.

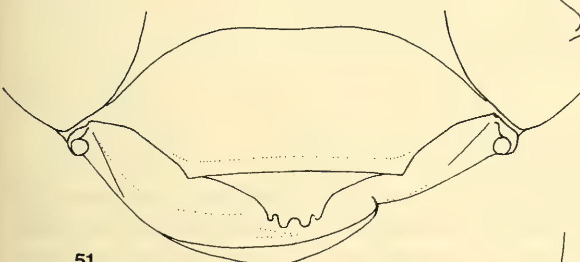
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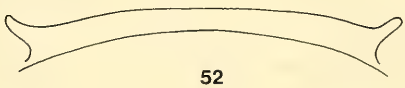
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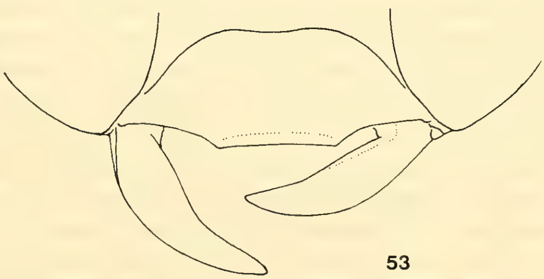
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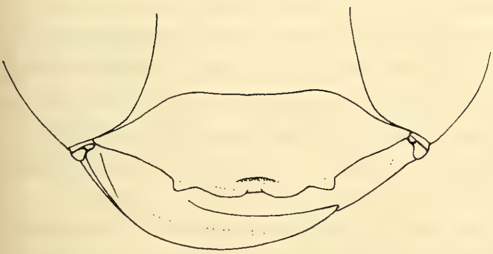
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52



53



54



55

Figs. 49—50. *P. araguensis* sp. n., ♀, holotype; 49, clypeus; 50, pronotum. Figs. 51—53. *P. annulipes* (Cameron); 51, clypeus of ♀; 52, pronotum of ♀; 53, clypeus of ♂. Figs. 54—55. *P. denticollis* sp. n., ♀, holotype; 54, clypeus; 55, pronotum.

Venezuela: 1 ♂, holotype, Aragua, 2 km north Ocumare de la Costa, 12 June 1976, A. S. Menke and D. Vincent (USNM).

This male is very similar to *P. menkei* sp. nov. described after a single female collected at the same locality but not on the same day. In view of the longer petiole and the different ratio of POD : OOD, I provisionally consider it a distinct species, also very closely related to *P. araguensis*, from which it differs in the colour of gaster and legs.

The specific name refers to the absence of tyloidea or carinae on the antennae.

Group of *annulipes*

Pluto annulipes (Cameron)
(figs. 51—53, 56—57)

Cameron, 1891: 130—140, ♀ (*Psen annulipes*; Mexico).
Kohl, 1896: 292.
Dalla Torre, 1897: 347.
Ashmead, 1899: 225.
Bohart & Menke, 1976: 171 (*Pluto annulipes*, new combination by Bohart).

Female. — Length 10—12 mm. Black. Mandibles, base of flagellum below and last antennal segment reddish-brown. Pronotal tubercles dark brown or black, tegulae and veins of wings dark brown, stigma yellowish-brown, wings infuscated. Foreside of fore tibiae reddish-brown, outer side of base ivory-white. Mid tibiae dark brown or black, base ivory-white. Basal 2/5 of hind tibiae in lateral view whitish, back of tibiae nearly entirely whitish. Tarsi brown; basitarsus of mid legs and basitarsus and second tarsal segment of hind legs whitish, extreme base of hind basitarsus dorsally brownish, sometimes also second tarsal segment of hind legs pale brown. Hind margins of tergites somewhat reddish transparent.

Protruding median part of clypeal margin (fig. 51) about half total width of margin, almost straight, lateral angles oblique. Frons shining, depressed between anterior ocellus and oculi, lower part of frons medially with fine hairbearing punctures. Ocellar region raised. Vertex shining, sparsely punctate. POD equal to OOD. Intercarinal space about as wide as fore basitarsus. Occipital carina high, mid-ventrally receding backward. Antennae slightly widening towards apex, segments longer than broad.

Lateral pronotal angles with long lobular projection (fig. 52). Propleura emarginate below. Scutum, scutellum, sides of thorax and mesosternum shining, sparsely punctate. Scutellum impressed medially, anterior suture crenulate. Propodeal enclosure shining, large pentagonal median area; back of propodeum dull owing to microsculpture, coarsely reticulato-carinate. Petiole nearly as long as first tergite, this tergite longer than broad. Pygidial area slightly over twice as long as broad. Base of hind tibiae with many short, broad thorns. Second recurrent vein of fore wings ending in third submarginal cell.

Pubescence of face pale golden, mostly appressed, pubescence of pronotal

collar more silvery, appressed, pygidial area with dark-brown to golden-brown backward directed pubescence. Rest of body greyish pubescent.

Male (first description). — Length 9—10 mm. Very similar to female. Bases of fore and mid tibiae may be dark. Mid and hind basitarsi whitish, second tarsal segments not so. Clypeal margin slightly emarginate (fig. 53). Antennal segments 5—11 or 5—12 with linear tyloides, on segments 5—10 reaching at most middle of segments, 11—12 about as long as 1/3 of segment, a very short tyloides on segment 13. Petiole somewhat longer than first tergite, this tergite 1.5 times as long as broad.

Pubescence of face silvery.

Genitalia: figs. 56—57.

Material examined: Mexico: 1 ♀, type No. 21.827, Guerrero, Rincon, 2800 ft, September, H. H. Smith; 1 ♀, Guerrero, Chilpango, 4600 ft, October, H. H. Smith, "*Psen annulipes* Cam."; 1 ♀, Tabasco, Teapa, February, H. H. Smith, Cameron Collection 1914—110 (BM). All these specimens are recorded by Cameron (1891). I could not trace the female recorded from Amula (6000 ft). In the Naturhistorisches Museum, Vienna, is a female from Mexico, Orizaba, 5 May 1871, Bilimek, labelled "*annulipes* Cam." by Kohl.

New records from Mexico: Chiapas: 1 ♀ and 1 ♂, Simojoval, 17 March 1953, E. I. Schlinger; 1 ♀ and 2 ♂, 20 mi south Tuxtla Gutiérrez, 12 Aug. 1963, F. D. Parker and L. A. Stange (UCD). Durango: 1 ♂, Tlahualilo, July 1905, Hunter No. 888, A. W. Morrill (USNM). Guerrero: 1 ♀, 8 mi north Taxco, 5500 ft, 19 June 1959, H. E. Evans (CU). Hidalgo: 1 ♀ and 1 ♂, Jacala, 4500 ft, 31 Aug. 1963, Scullen and Bolinger (OSU). Jalisco: 1 ♀, Guadalajara, Crawford; 1 ♀, 20 mi north La Quemada, 27 July 1954, M. Casier and W. Gertsch Bradts (UCD). Morelos: 4 ♀, Yautepec, 31 July 1963, F. D. Parker and L. A. Stange (UCD); 1 ♀, 26 mi south Cuernavaca, 3150 ft, 28 Aug. 1963, Scullen and Bolinger (OSU). Nuevo Léon: 1 ♂, Linares, 5 Oct. 1962, H. and M. Townes (HT). Oaxaca: 1 ♂, 104 mi south Acayucan, 750 ft, 18 Aug. 1963, Scullen and Bolinger (OSU). San Luis Potosí: 1 ♀, El Salto, 1800 ft, 8 June 1961, on flowers of *Kallstroemia hirsutissima*, Univ. Kansas Mex. Exped. (KU). Tamaulipas: 2 ♀, Gomez, Fariás and vic., 400—600 m, 20—24 July 1965, in Malaise trap, Cornell University Mexico Field Party (CU). Veracruz: 2 ♀, Fortin de las Flores, 11 and 14—21 Sept. 1954, F. X. Williams (CAS); 1 ♂, Córdoba, 20 July 1966, J. S. Buckett, M. R. and R. C. Gardner (UCD).

The male from Oaxaca has black fore and mid legs, only foreside of fore tibiae being somewhat brownish. The tyloidea are shorter, less than 1/4 length of segment on segments 9—10, very small on segment 11, lacking on segments 12—13. The male from Simojoval has entirely brown tarsi. Also the females may have their hind tarsi different from the usual form; sometimes the second tarsal segment or even a part of the basitarsus are brown or these parts are paler than usual, not only the basitarsus and the following segment being whitish, but also the third tarsal segment.

First record from Costa Rica: 1 ♂, Liberia, 400 ft, 29 July 1963, Scullen and

Bolinger (OSU). This male has dark hind basitarsi, the hind margins of the tergites are more reddish, length about 8 mm. It may represent a different subspecies.

First record from El Salvador: 1 ♀, Quezaltepeque, 17 June 1963, D. Cavagnaro and M. E. Irwin (UCD). The greater part of the hind basitarsi and all of the second tarsal segment are brownish.

P. annulipes and *P. smithii* are the largest species of the genus *Pluto*. They are readily distinguished by the long lateral projections of the pronotum. The females of the two species differ in colour, mainly in that of the legs; the males have different tyloidea.

Pluto smithii (Fox)
(figs. 58—60)

Fox, 1898a: 378—379, ♂ (*Psen Smithii*; Brazil, Chapada (dos Guimaraes), Mato Grosso).
Bohart & Menke, 1976: 171 (*Pluto smithii*, new combination by Bohart).

Male. — Much resembling the male of *P. annulipes*. Length about 10 mm. Apical half of fore femora, all of fore and mid tibiae and tarsi reddish-yellow, mid basitarsi paler. Basal 2/5 of hind tibiae whitish. Hind tarsi yellowish-white, last segment largely brown. Pronotal tubercles and tegulae yellowish. Base of second tergite red. Antennae including scape yellowish-red, dorsally partly brown. Stigma of fore wings little paler than veins. Tyloides on antennal segments 5—6 about 3/4 length of segments, on segments 7—12 almost as long as segments, a very short tyloides on segment 13.

Face and tempora pale golden, mostly appressed, pubescent. Thorax and gaster with brownish or yellowish-silvery hairs, underside of hind femora with long silvery-white hairs.

Genitalia: figs. 58—60.

First description of female. — Resembling male, structurally not different from the female of *P. annulipes*. Length 11—13 mm. Gaster black, hind margins of segments somewhat reddish transparent. Pronotal tubercles yellowish. Fore tibiae entirely yellowish-red. Base of hind tibiae reddish, with many brown, flattened thorns. Fore basitarsus usually reddish, mid basitarsus and mid tarsal segment 2 or segments 2—3 whitish. Hind basitarsus and following two or three segments whitish, basitarsus dorsally with a row of thorns, as on hind tibiae. Pubescence of face darker golden.

New records from Brazil: Mato Grosso: 1 ♀, Sinop, 12°31'S, 55°37'W, Oct. 1974, M. Alvarenga (HT). Minas Gerais: 1 ♀, Alpinopolis, Febr. 1961, C. Elias; 2 ♂, Passos, 17—23 April and 7 May 1963, C. Elias (UFP). Pará: 1 ♀, 10 Sept. 1901, Ducke, 273 (NMW); 1 ♀, Soure, Ilha de Marajó, O. Bertram (ZMB). Rio de Janeiro: 1 ♀, Mangaratiba, April 1962, M. Alvarenga (UFP).

This species apparently replaces the Central American *P. annulipes* in South America. Because of the different length of the tyloidea of the males it is likely that *P. smithii* is a distinct species with many subspecies. Chapada, in Brazil, being

the type-locality I have provisionally considered the Brazilian material, two females and two males from Minas Gerais and Rio de Janeiro, and a female from Mato Grosso, to belong to the form as described by Fox. The identification of the two females from Pará is somewhat doubtful, their fore tibiae and their antennae being darker than in the other Brazilian specimens. A series of males from Paraguay is closely related to the Brazilian form; unfortunately I have seen no females from Paraguay. The other forms are recorded below together with their distinctive characters. A study of ample material from more regions could be interesting.

Form A. Paraguay: 36 ♂, San Bernardino, mid Febr. — early April, Fiebrig (NMW). Length 8—10 mm. Tyloidea on segments 4—13 somewhat longer, reaching nearly to end of segment on segments 5—6. Gaster more or less red, sometimes all of tergites 1—2 and sternite 1 red, rarely only base of tergite 2 red. Basal four segments of hind tarsi whitish. Stigma of fore wings somewhat paler.

Face and tempora silvery pubescent, vertex and dorsal side of thorax brownish.

Form A. Bolivia: 1 ♂, Buenavista near Santa Cruz, 1928, J. Steinbach (CU); 2 ♂, Prov. Sara, Steinbach (MCZ). Face slightly golden, base of second tergite red.

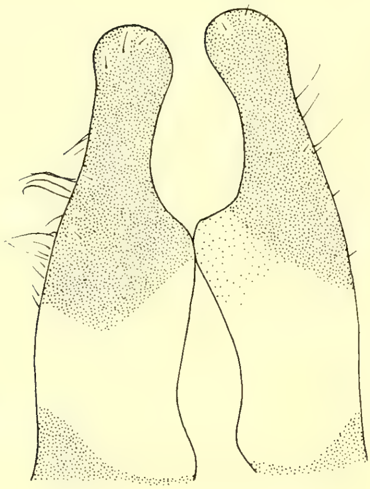
Form B. Paraguay: 1 ♂, Caballero, Nov. 1971, Peña (MF). Base of tergite 2 black. Segments 4—5 of hind tarsi dark brown. Stigma dark. Distinct tyloidea on segments 5—13, about 3/4 length of segments. Face pale golden.

Form C. Argentina: Salta: 3 ♀ and 1 ♂, Rio Pescado (Est. YPF), 19—25 Nov. 1967, C. Porter, E. Willink (MCZ); 1 ♀, Prov. Salta, 1200 m (NMW); Yuto, 1 ♀, 9 Jan. 1966, H. and M. Townes (HT). Salta-Orán: 1 ♂, Abra Grande, 10 Jan. — 1 March 1967, R. Golbach (IML); 4 ♀, Abra Grande, 18 April—5 May 1969, C. Porter (MCZ); 1 ♀, Jujuy (MF). Tucumán: 1 ♀, Horco Molle, Dec. 1968, C. C. Porter (CNC). Scape of antennae and greater part of dorsal side of flagellum black in both sexes. Fore tibiae of female sometimes with dark outer streak. Usually hind basitarsus and next two or three segments whitish. Hind margin of tergite 1 often reddish. Base of tergite 2 black. Pronotal tubercles yellowish-red. Face of male pale golden, of female darker golden.

A series of females collected in the province of Entre Rios is very similar but the scape of the antennae is entirely red in most specimens. Hind tarsi except for the last segment whitish. Fore tibiae and tarsi entirely reddish. Base of hind tibiae whitish. First gastral tergite in all females except for the specimen collected in 1964 with broad red hind margin. Argentina: Entre Rios: Pronunciamento, 1 ♀, March 1964, 1 ♀, 3—9 Febr. 1965, 6 ♀, 28 Febr. 1965 (FAG).

Form D. Argentina: 2 ♂, Tucumán, El Solidad, 11 km west Las Cejas, 13 Febr. and 15 Dec. 1967, L. A. Stange (UCD). Tyloidea short as in *P. annulipes*. Face silvery. Segments 1—3 of hind tarsi whitish. Apical half of tergite 1 conspicuously red, also hind margins of following segments reddish. Scape of antennae reddish.

Form E. Panama Canal Zone: 1 ♀, Culebra-Arrijan Trail, 25 Dec. 1914, T. Hallinan (AMNH); 1 ♀, Barro Colorado Is., 16 March 1967, Roger Dakro (UCD).



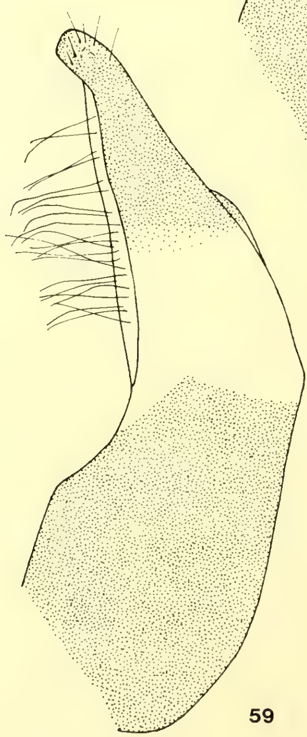
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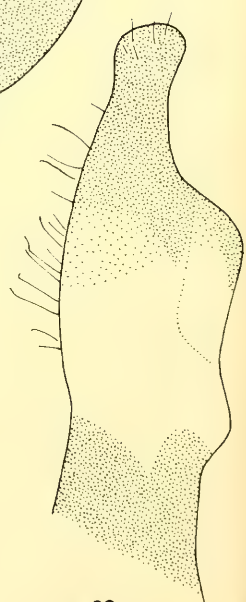
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Figs. 56—57. *Pluto annulipes* (Cameron), genitalia of ♂, Acayucán, dorsal and lateral aspect. Figs. 58—60. *P. smithii* (Fox), genitalia of ♂, Paraguay, dorso-lateral, lateral and dorsal aspect.

Pronotal tubercles dark brown with paler hind margin. Gaster black. Posterior surface of fore tibiae brown. Base of hind tibiae with dark brown thorns. Segments 1—3 of hind tarsi yellowish-white. Stigma of fore wings paler than veins. Face pale golden.

Form F. Surinam: 1 ♀, NE Surinam (Exp. I), Mungatapu Wia Wia, 3rd camp line km 14.9, "ritsenbos 1795", 15 Oct. 1948, D. C. Geijskes c.s.; 1 ♀, Republiek, 24—26 Sept. 1963, Malaise trap, D. C. Geijskes; 1 ♀, Zanderij, Kreekbos, 18—21 July 1964, Malaise trap, D. C. Geijskes; 1 ♀, Mapane Area, Camp 8, LBB, 29 May 1963, J. van der Vecht (ML). Resembling the Brazilian form but scape of antennae black and fore tibiae with black streak on outer surface. Gastral tergites 1—2 not distinctly red. Pronotal tubercles reddish-yellow, stigmata of fore wings paler than veins. Segments 1—3 or 1—4 of hind tarsi whitish.

Form F. Venezuela: 1 ♀, Trujillo, Sabana Grande, 3 June 1976, 2 ♀, Aragua, 2 km north Ocumare De La Costa, 12 and 21—22 June 1976, 1 ♀, Zulia, 6 km west La Concepcion, 18 June 1976, A. S. Menke and D. Vincent (USNM). Like Surinam females but pronotal tubercles dark brown or black in three of the specimens, in one female they are yellowish-brown.

Form F. Trinidad: 1 ♀, Maraccas Valley, 4 Aug. 1937, O. W. Richards (BM).

Form G. Colombia: 1 ♀, Meta, La Macarena, 20—29 Nov. 1976, M. Cooper (BM). Differs from the Surinam females in having the antennae almost entirely black, only segments 3—4 being somewhat reddish beneath. Pronotal tubercles brownish with yellowish hind margin. Hind tarsal segments 1—4 whitish.

A male from Bogotá, Lindig, 19704 (ZMB) may belong to the same form. Scape of antennae partly red. Tergite 1 with narrow reddish hind margin. Fore tibiae entirely reddish. Face pale golden. The tyloidea on segments 5—12 are relatively short, about 2/3 length of segments; only basitarsus of hind legs whitish.

Pluto denticollis sp. nov.
(figs. 54—55)

Female. — Length about 8.5 mm. Black. Mandibles yellowish-red. Flagellum of antennae orange-brown, apical half dorsally darker brown. Pronotal tubercles dark brown. Tegulae yellowish-red. Fore and mid tibiae and tarsi, base of hind tibiae, hind tarsi reddish-yellow. Hind margins of tergites and sternites reddish transparent, pygidial area dark reddish. Veins of wings brown, stigma pale brown.

Median part of clypeal margin smooth and shining, four blunt lobes (fig. 54). Upper 2/3 of disk densely punctate. Frons and vertex smooth and shining. Intercarinal space narrower than width of fore basitarsus. Antennal segments 10—11 about quadrate, last segment about 1.5 times as long as broad.

Lateral pronotal angles in dorsal aspect protruding as an equilateral triangle (fig. 55) with rounded apex. Scutum and scutellum shining, sparsely finely punctate. Prescutal sutures indistinct. Metanotum dull. Enclosed area of propodeum shining, with sharp oblique lateral carinae and with large median pentagonal area.

Back of propodeum reticulato-carinate, dorso-lateral carinae parallel. Sides of thorax and mesosternum smooth, mesopleura almost impunctate. Anterior oblique suture narrow, weakly crenulate, widened upper part smooth. Petiole slightly longer than first tergite, this tergite about as long as broad. Pygidial area less than twice as long as broad, densely punctate. Second recurrent vein of fore wings interstitial.

Pubescence of face golden, mostly appressed. Tempora with short golden pubescence. Frons and vertex with sparse, long golden-brown hairs. Pubescence of scutum, scutellum and metanotum brownish-golden, pygidial area densely golden-brown pubescent, last tergite laterally with long erect brown hairs; remainder of thorax and of gaster yellowish-grey pubescent.

Male unknown.

Peru: 1 ♀, holotype, "Peru" (NMW).

As *P. denticollis* has conspicuous triangular projections of the pronotum and as its scutum and mesopleura are smooth and its face is golden, this species is easily recognized. It seems to belong to the group of *annulipes* (Cameron) but differs in the shape of the clypeal margin which has four small lobes instead of being straight.

The specific name refers to the lateral projections of the pronotal collar.

Group of *pygmaeus*

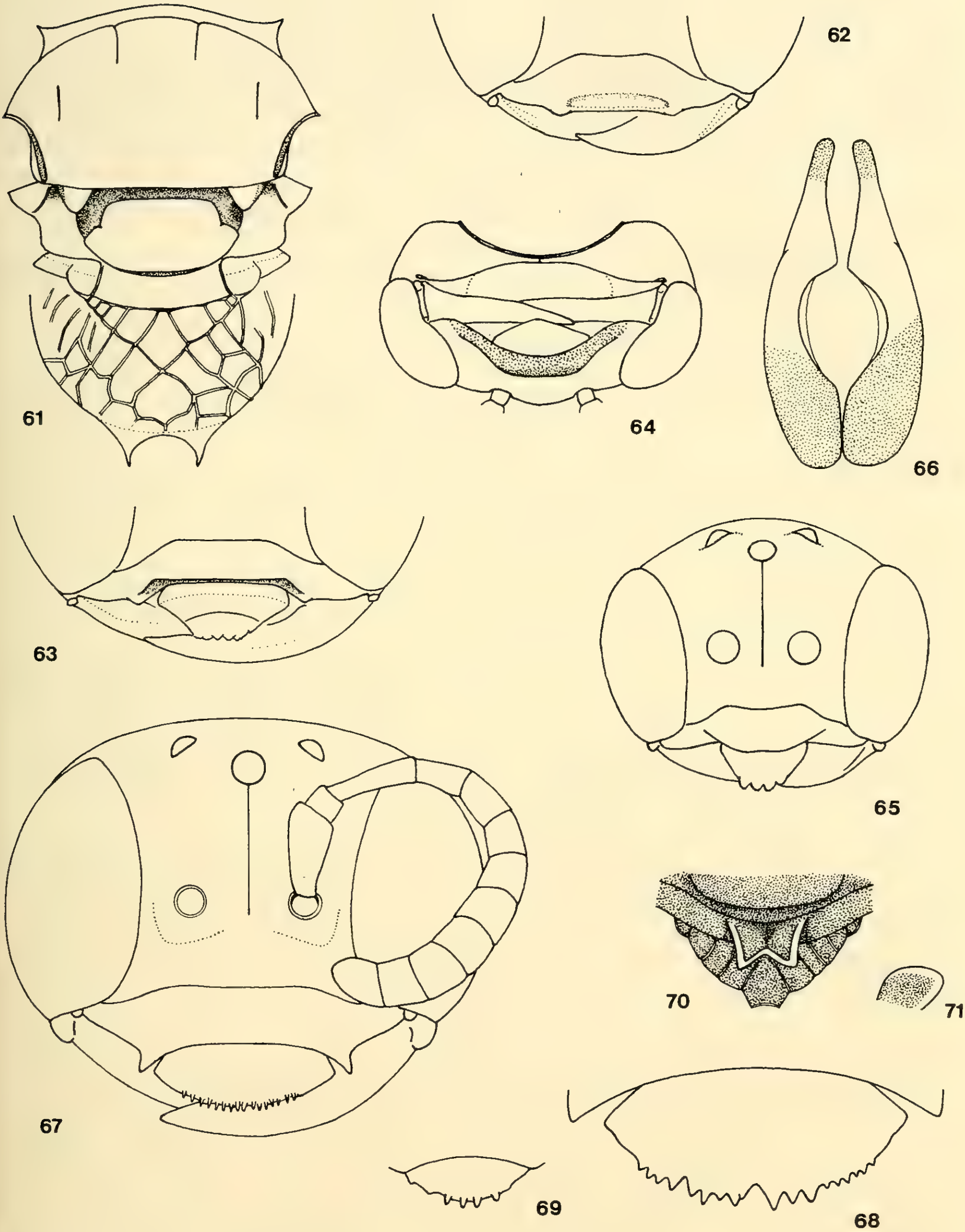
Pluto pygmaeus pygmaeus (Brèthes) comb. nov.
(figs. 61—62)

Brèthes, 1913: 130, ♀ (*Gorytes pygmaeus*; Argentina: La Paz).
Bohart & Menke, 1976: 490 (*Ochleroptera pygmaea*).

Female. — Length about 5.5 mm. Black, following parts orange-brown: mandibles, underside of flagellum, fore and mid tibiae and tarsi, base of hind tibiae. Labrum reddish. Hind tarsi brownish with paler apices. Pronotal tubercles and tegulae yellowish-brown. Sternites with reddish hind margins. Last gastral segment reddish-brown. Veins of wings brown.

Median part of clypeal margin slightly emarginate, almost straight, with small lateral teeth or angles, distance between these teeth about half total width of clypeal margin (fig. 62). Before narrow margin a low shining ridge. Disk densely punctate. Median part of frons densely finely punctate, laterally a low shining tubercle, vertex almost smooth, sparsely finely punctate. Back of head, especially laterally, very finely reticulate alutaceous. Intercarinal space narrow. Antennae short, clavate, segments 10—11 shorter than broad.

Pronotal angles sharp (fig. 61). Anterior part of scutum finely reticulate alutaceous, rest shining, sparsely finely punctate. Scutellum entirely reticulate alutaceous, more densely punctate, interstices once or twice as large as punctures. Axillae triangular with rounded apex, on inner and posterior side free from scutellum, reaching about halfway distance from base to scutellum (fig. 61).



Figs. 61—62. *Pluto pygmaeus pygmaeus* (Brèthes), ♀, Argentina; 61, thorax in dorsal aspect; 62, clypeus. Figs. 63—65. *P. facialis* sp. n.; 63, clypeus of ♀, holotype; 64—65, head of ♂, allotype, ventral and frontal aspect. Fig. 66. *P. axillaris* sp. n., Bolivia, genitalia of ♂, dorsal aspect. Figs. 67—71. *P. joergenseni* (Brèthes); 67, head of ♀, Cordoba; 68, labrum of same, more enlarged; 69, labrum of ♂, Rio Negro, same enlargement; 70, metanotum of ♂, Bolivia; 71, raised part of metanotum in lateral aspect.

Scutellar suture smooth, laterally open. Propodeal enclosure shining, large median area; back of propodeum coarsely reticulato-carinate (fig. 61). Mesopleura and mesosternum finely reticulate alutaceous, finely punctate, interstices on mesopleura a few times size of punctures, mesosternum densely finely punctate. Hypoepimeral area finely reticulate alutaceous, sparsely punctate. Anterior plate of mesepisternum dull, anterior oblique suture crenulate, widened upper part with a transverse carina. Second recurrent vein of fore wings interstitial. Petiole about as long as first tergite, this tergite longer than broad. Pygidial area little more than 1.5 times as long as broad.

Face silvery, mostly appressed, pubescent; pygidial area golden-brown, rest of body greyish-white pubescent.

First description of male. — Length about 5 mm. Similar to female, gaster more slender. Clypeal margin medially somewhat protruding, clypeus before margin somewhat thickened. Antennal segments 10—12 somewhat longer than broad, segment 13 about 1.75 times as long as broad; segments 5—12 with long linear tyloides, often short on segment 5, sometimes also one on segment 13. Occipital carina and hypostomal carina very close. Vertex behind ocelli very finely striate. Axillae with parallel sides, little longer than broad. Petiole about as long as first tergite, this tergite 1.5 times as long as broad.

Material examined: 1 ♀, holotype, with labels "Mendoza", "No. 10401", and "*Gorytes pygmaeus* Br." P. Jörgensen (MACN).

Brèthes made no mention of the peculiar shape of the axillae and he wrongly placed his species in the genus *Gorytes*. Mr. M. A. Fritz, Buenos Aires, discovered that the type is a Psenid wasp and he was very helpful to have it sent to me for study. He also informed me that La Paz, which locality is mentioned only in the original description, not on the label pinned under the insect, is a small village in the province of Mendoza (Argentina), where Jörgensen often collected insects.

New records from Argentina: Catamarca: 1 ♀, 6 km north Belén, 1240 m, 1—15 Jan. 1970, Malaise trap, Entomofauna Subandina, Willink-Terán-Stange (IML); 2 ♀, 16—30 Nov. 1968, 4 ♀, 1—31 Jan. 1969, Los Nacimientos de Abajo, Malaise trap, Entomofauna Subandina, Willink-Terán-Stange (IML); 1 ♀, Belén, 25 Nov. 1975, R. M. Bohart, 1 ♀, La Cienega, 17 Dec. 1975, R. M. Bohart (UCD). Jujuy: 2 ♀ and 3 ♂, Porto Lozano, 28 Nov. — 2 Dec. 1967, 6 ♀ and 9 ♂, Posta Lozano, 28 Nov. — 19 Dec. 1967, 4 ♀ and 4 ♂, Rio Lozano, 28 Nov. — 20 Dec. 1967, C. C. Porter and E. Willink (MCZ). Mendoza: 16 ♀ and 5 ♂, 25 Nov. — 25 Dec. 1906, 1 ♀, 1 Febr. 1907, Mendoza, Jensen-Haarup (ZMB); 10 ♀ and 3 ♂, Mendoza (NMW); 2 ♀, Mendoza, Chacras de Coria, 21 Febr. 1966, S. Stange (IML). Salta: 1 ♀, Rio Pescado (Est. YPF), 19—25 Nov. 1967, C. Porter and E. Willink; 1 ♀, Cachi, 20—22 Jan. 1966, 1 ♀ and 1 ♂, Orán, Abra Grande, 18—25 Oct. 1968, 1 ♀, Camp Jakúlica, ca. Aguas Blancas, Oct. 1968, C. C. Porter (MCZ); 1 ♀ and 2 ♂, Tartagal, Nov. 1971, 1 ♀, Pocitos, Dec. 1971 (MF); 4 ♀, Angastaco, 7 Dec. 1968, Entomofauna Subandina, A. Willink-Stange (IML). Santiago del Estero: 1 ♀, Suncho Corral, 25 Dec. 1975, R. M. Bohart (UCD). Tucumán: San Pedro, Colalao, 2 ♂, Foerster (MF); 2 ♀, 8—9 Nov. 1969, L. A. Stange (UCD); 4 ♀, Quebrada Lules, 9 Dec. 1964, C. C. Porter (MCZ). Argentina: 1 ♂ (USNM).

First records from Peru: 1 ♂, 43 mi east Tingo Maria, 1200 m, 18 Nov. 1954, E. I. Schlinger and E. S. Ross (CAS); 1 ♀, Madre de Dios Dep., Avispas, 400 m, 12—20 Sept. 1962, L. E. Peña (CNC); 1 ♀, Madre de Dios dep., Avispas, 30 m, nr. Marcapata, 1—15 Oct. 1962, Luis Peña (HT). The face of the latter female is distinctly golden pubescent.

First record from Bolivia: 1 ♀, Luis Calvo, Tiguipa, Jan. 1972 (MF). Face golden.

The group of *pygmaeus* has very interesting axillae which are not connected posteriorly with the scutellum. I have not seen this character in any other Psenini. The females have the usual characteristic long stiff bristle on the hind coxae.

Pluto pygmaeus axillaris subsp. nov.
(fig. 66)

This form closely resembles the nominate subspecies but differs in the following characters.

Female. — Vertex and back of head with bluish reflection. Median part of clypeal margin very weakly emarginate, almost straight, with indistinct lateral angles or teeth, distance between these teeth about half total width of clypeal margin. Depressed margin of clypeus shining, behind this margin a weak, shining ridge, disk of clypeus densely punctate. Frons and vertex shining, almost impunctate, median part of frons dull, finely punctate; near oculi a large shining tubercle; back of head smooth and shining.

Scutum and scutellum shining, sparsely finely punctate, interstices on scutellum a few times size of punctures. Mesopleura and mesosternum finely reticulate alutaceous, almost smooth, sparsely finely punctate. Hypo-epimeral area shining, sparsely finely punctate. Anterior plate of mesepisternum almost shining. Second recurrent vein of fore wings ending in third submarginal cell.

Male. — Head and scutum with bluish shine. Mandibles yellowish. Pronotal tubercles brownish. Fore and mid tibiae, base of hind tibiae and all tarsi yellowish-brown, bases of segments 2—5 of hind tarsi brown, often somewhat darker. Axillae brown.

Antennal segments 6—13 with long linear tyloides, short but rarely absent on last segment. Axillae with parallel sides and rounded apex, about 1.5 times as long as broad. Genitalia: fig. 66.

Colombia: 1 ♀, holotype, Meta Cord., Macarena, 15—28 Febr. 1976, M. Cooper (BM).

Bolivia: 18 ♂, allotype and paratypes, Huachi Beni, September, Mulford Bio Expl. 1921—22, Wm. M. Mann (USNM); 1 ♀, paratype, Coroico (ZMB). Further paratypes:

Brazil: Mato Grosso: 1 ♀, Gallery Forest, 12°50′ south, 51°47′ west, 5 Oct. 1968, Royal Soc. and Royal Geogr. Soc. Expedition, O. W. Richards (BM); Sinop, 12°31′ south, 55°37′ west, 9 ♀, Oct. 1974 and 4 ♀, Oct. 1975, M. Alvarenga (HT).

Pará: 1 ♀, Ipean, Belém, 1—4 Dec. 1969, J. M. and B. A. Campbell (CNC). São Paulo: 1 ♂, Faz. Campininas, Moni Guacu, 1—8 Jan. 1970, J. M. and B. A. Campbell (CNC). Minas Gerais: 1 ♀, Pedra Azul, Nov. 1970, F. M. Oliveira (HT). Distrito Federal: 2 ♀, Estacao Florestal, Cabeca do Veado, 3600 m, 14—30 Oct. 1971, E. G., I. and E. A. Munroe (CNC).

British Guyana: 1 ♀, Essequibo River, Moraballi Creek, 3 Sept. 1929, Oxford University Expedition (BM).

Surinam: 1 ♀, Republiek, 19 Oct. 1963, D. C. Geijskes; 1 ♀, Zanderij, Kreekbos, 10—14 July 1964, Malaise trap, D. C. Geijskes (ML).

One female from Brazil has the pubescence of the face distinctly golden: Rio de Janeiro, Baía de Guanabara, Floresta dos Macacos, April 1961, M. Alvarenga (KU). In the female from Bolivia the face is pale golden.

The differences between *axillaris* and the nominate subspecies are very small. The clypeal margin of the females seems to be slightly different but this also depends upon the angle at which the insect is examined.

The subspecific name refers to the axillae which are somewhat longer than in the nominate subspecies, at least in the male.

Pluto facialis sp. nov.
(figs. 63—65)

Female. — Length about 5.5 cm. Black. Underside of flagellum orange-brown, labrum and mandibles reddish. Pronotal tubercles whitish, tegulae brown. Fore and mid tibiae and tarsi and basal 1/3 of hind tibiae yellowish-brown, mid tibiae partly darkened, hind tarsi dark brown, apices of gastral segments yellowish-brown. Pygidial area dark reddish. Veins of wings brown.

Median part of clypeal margin straight, thickened, very deeply emarginate, exposing labrum (fig. 63). Median part of frons raised, finely punctate. Vertex shining, sparsely punctate. POD about equal to OOD. Intercarinal space narrow. Mandibles long. Antennae short, clavate, segments 9—11 shorter than broad, segment 12 about 1.5 times as long as broad.

Anterior carina of pronotal collar high, laterally protruding as a large tooth. Scutum and scutellum shining, sparsely finely punctate. Axillae triangular with rounded apex, almost reaching halfway distance from base of axillae to scutellum. Scutellar suture not crenulate. Propodeal enclosure shining, with high posterior carina, large median area and few oblique lateral carinae. Back of propodeum somewhat shining, very coarsely reticulato-carinate, carinae high. Hypo-epimeral area, mesosternum and upper half of mesopleura finely reticulate alutaceous, lower half of mesopleura shining. Mesopleura and hypo-epimeral area sparsely finely punctate, mesosternum densely finely punctate. Anterior oblique suture crenulate, anterior plate of mesepisternum dull. Second recurrent vein of fore wings interstitial. Petiole as long as first tergite, this tergite somewhat longer than broad. Pygidial area slightly over 1.5 times as long as broad.

Pubescence of face pale golden, partly appressed. Tempora and pronotal collar

with short, yellowish-silvery pubescence, pygidial area dark brown, rest of body yellowish-grey pubescent.

Male. — Length about 5 mm. Lower part of clypeus shining, raised (figs. 64, 65) and protruding over emarginate margin. Antennae somewhat clavate, segments 11—12 longer than broad, segments 5—12 or 6—12 with linear, not very distinct, tyloidea. Axillae with almost parallel sides, longer than broad, apex rounded. Mesopleura, hypo-epimeral area and mesosternum smooth and shining. Face pale golden.

Colombia: 1 ♀, holotype, 1 ♂, allotype, 8 ♂ paratypes, Meta, Rio Duba, 8—12 March 1976, M. Cooper (BM).

P. facialis belongs to the group of *P. pygmaeus* (Brèthes) and is easily recognized by the deeply emarginate clypeal margin of the female and the raised clypeal disk of the male.

The specific name refers to the peculiar shape of the clypeus, of the female as well as of the male.

Group of *joergenseni*

Pluto joergenseni (Brèthes) comb. nov.
(figs. 67—71)

Brèthes, 1913: 120, ♂ (*Psen Jörgenseni*; Argentina: La Paz).
Bohart & Menke, 1976: 171 (*Pseneo joergenseni*).

The holotype, which was kindly sent to me by Dr. M. J. Viana, Buenos Aires, has no head, but the characteristic shape of the metanotum does not leave any doubt as to its identity. Brèthes recognized this peculiar shape of the metanotum in his description as follows: "postscutello paulum elevato, postice christa in media incisa acuta". His reference to the pygidial area is confusing.

Male. — Length 5.5—7 mm. Head and thorax black. Mandibles dark reddish. Underside of flagellum yellowish-red. Pronotal tubercles yellowish-white or reddish-brown. Fore tibiae and tarsi yellowish-red, mid tibiae and tarsal segments 2—4 yellowish-red, basitarsus yellowish-white, last segment brown. Basal third of hind tibiae and entire basitarsus yellowish-white, tarsal segments 2—4 pale brown or yellowish-brown, last segment dark brown. Veins of wings brown. Gaster black, hind margin of first tergite red, second tergite usually entirely red, sometimes also base of tergite 3; or gaster black with reddish transparent hind margins.

Anterior margin of clypeus emarginate, distinct lateral teeth, distance between these teeth about 1/3 of total width of margin. Labrum with irregular margin and four distinct median teeth (fig. 69). Frons, except for lateral parts, dull, densely punctate. Interocellar area and vertex reticulate alutaceous, sparsely punctate. Occipital carina complete, below in the middle receding backward. Intercarinal space broader than first basitarsus. Antennae slightly widening toward apex, not distinctly clavate, segments 6—11 with narrow tyloides.

Lateral pronotal angles in frontal view with small, obliquely upward directed

tooth. Scutum and scutellum reticulate alutaceous, sparsely punctate. Metanotum (figs. 70—71) in the middle with two small raised wings, their margins membraneous, somewhat yellowish transparent. Propodeal enclosure shining, with high oblique carinae and large median area, back of propodeum dull, coarsely reticulato-carinate. Hypo-epimeral area rugose. Mesopleura and anterior plate of mesepisternum finely reticulate alutaceous, irregularly and rather coarsely punctate, punctures medially partly in rows, interstices on upper and lower part a few times size of punctures. Anterior oblique suture crenulate. Petiole longer than first tergite, this tergite about 1.5 times as long as broad. Second recurrent vein of fore wings ending in third submarginal cell.

Face and pronotal collar silvery, mostly appressed, pubescent; pubescence of rest of body whitish.

Female. — Length about 7—8 mm. Colour mostly as in male, outer side of fore and mid tibiae yellow, hind tarsal segments 1—4 yellowish-white. Microsculpture as in male but punctation of mesopleura finer. Clypeal margin widely emarginate, laterally with a large tooth, distance between teeth over half total width of clypeal margin (fig. 67). Labrum different from that of other *Pluto*, margin having many small teeth (fig. 68).

Median part of metanotum somewhat raised, margined by a sharp lateral carina, no "wings". Hypo-epimeral area dull, superficially punctate. Petiole about as long as first tergite, this tergite about 1.5 times as long as broad. Pygidial area over 1.5 times as long as broad. Pubescence of face silvery, of pygidial area golden-brown.

Material examined: 1 ♂, holotype, with labels "Mendoza", "No. 10405" and "*Psen Jörgenseni* Br.", coll. P. Jörgensen (MACN). Although the locality-label only mentions Mendoza, it is evident from the original description (1913) that this specimen has been collected in the small village La Paz (province of Mendoza, in Argentina; information by letter from Mr. M. A. Fritz).

New records from Argentina: Catamarca: 1 ♂, San Antonio, 6—18 Febr. 1958, R. Golbach (IML); 1 ♂, Tinogasta, 8 Nov. 1966, L. Stange (IML); 1 ♀, 2 km west Cordobita, 30 Nov. 1968, Entomofauna Subandina, Stange - A. Terán (IML); 3 ♀ and 1 ♂, Belén, 25 Nov. 1975, R. M. Bohart (UCD). Córdoba: Córdoba, 1 ♀, Dec. 1940, Christensen (MF), 1 ♀, Jan. 1947 (IML), 3 ♂, Febr. 1971, M. Fritz (MF); Balnearia, 3 ♀, Fritz-Martinez (MF). La Plata: 1 ♂, Punta Lara, 13 Jan. 1970, Malaise trap, Vardy and Arguindeguy (BM). La Rioja: 1 ♂, B. P. Clark (USNM); 1 ♀, Anguiñan (Chilecito), 1—15 Febr. 1970, Entomofauna Subandina, Willink-Terán-Stange, Malaise trap (IML); 1 ♂, Villa Mazan, 19 Dec. 1975, R. M. Bohart (UCD). Mendoza: 1 ♀, Est. Pedregal, A. C. Jensen-Haarup (ZMC); 1 ♂, Potrerillos, 4000 ft, 16—20 March 1920, Cornell Univ. Exped., R. G. Harris (CU); 1 ♀, Potrerillos, 1000 m, 20 Jan. 1947, Hayward-Willink (IML); 1 ♂, Agrela, 23 Febr. 1966, L. Stange (IML). Misiones: 1 ♂, Bemberg, Alto Paraná, 21—31 March 1934, K. J. Hayward (BM). Río Negro: Lamarque, 1 ♀, A. Baier, 7 ♀ and 4 ♂, U. and M. Fritz, 1 ♂, Febr. 1958, U. and M. Fritz, 1 ♂, Jan. 1974, M. Fritz (MF); 1 ♂, Choele-Choel, Dto. Avellaneda, 24 Nov. 1946, Hayward-Willink; 1 ♀ and 2 ♂, Isla Choele-Choel 14 Jan. 1968, J. and L. Stange (IML). Salta: 3 ♀ and 2 ♂, Tartagal, Nov. 1971, M. Fritz (MF); 1 ♂, San Rafael (San Carlos), 7 Dec. 1968,

Entomofauna Subandina, Stange-A. Willink (IML); 1 ♂, Camp. Jakúlica, Ca. Aguas Blancas, Oct. 1968, 1 ♂, Orán, Abra Grande, 18—25 Oct. 1968, C. Porter (MCZ). San Juan: 6 ♀, Pie de Palo, 11 March 1920, Cornell Univ. Exped., R. G. Harris (CU). Santa Fé: 1 ♀, Alberdi, 685, 17 March 1912, J. Hubrich (BSM). Santiago del Estero: 1 ♂, Fernández, Jan. 1939, coll. Bosq (MF). Tucumán: 1 ♀, Tucumán, Jan. 1947, J. Cordoba (IML).

First records from Bolivia: Luis Calvo: 5 ♀ and 12 ♂, Tiguipa, Jan. 1972, M. Fritz; Cordillera, 1 ♀, Rio Grande, 16 Febr. 1971, Fritz-Martínez, 1 ♀, Abapó, Jan. 1972, M. Fritz (MF).

First records from Brazil: Mato Grosso: 1 ♀ and 3 ♂, Aguidauana, 11—13 Dec. 1919, Cornell Univ. Exped., R. G. Harris (CU). Minas Gerais: 1 ♀ and 2 ♂, Pirapora, 11—13 Nov. 1919, Cornell Univ. Exped. (CU); 1 ♀, Santa Vitória, Febr. 1970, F. H. Oliveira (AMNH). São Paulo: 1 ♀, Aguas São Pedro, 29 Jan. 1976, R. M. Bohart (UCD); 1 ♀, Municipio de Bertioga, 27—30 Nov. 1972, B.V. Peterson (CNC).

First record from Paraguay: 1 ♂, Pirareta, Dec. 1971, L. E. Peña (MF).

The widely emarginate clypeus of the female and the remarkable structure of the metanotum of the male are very characteristic.

REFERENCES

Alayo, D. P., 1973. Catálogo de los Himenópteros de Cuba: 1—218.

Ashmead, W. H., 1899. Classification of the entomophilous wasps, or the superfamily Sphegoidea. — Can. Ent. 31 (8) : 212—225.

———, 1900. Report upon the Aculeate Hymenoptera of the Islands of St. Vincent and Grenada, with additions to the parasitic Hymenoptera and a list of the described Hymenoptera of the West Indies. — Trans. ent. Soc. London, part 2: 207—305.

Bohart, R. M. & A. S. Menke, 1976. Sphecid wasps of the world: I-X, 1—695. University of California Press, Berkeley, Los Angeles, London.

Brèthes, J., 1913. Himenópteros de la América Meridional. — An. Mus. nac. Hist. nat. Buenos Aires 24: 35—165.

Cameron, P., 1891. Insecta. Hymenoptera (Fossores), fam. Mimesidae. — Biologia Centr.-Amer. 2: 129—176.

Cockerell, T. D. A., 1911. A new Psenid wasp from Peru. — Can. Ent. 43: 272.

Cresson, E. T., 1865. On the Hymenoptera of Cuba. — Proc. ent. Soc. Philad. 4: 1—200.

———, 1872. Hymenoptera Texana. — Trans. Am. ent. Soc. 4: 153—227.

———, 1916. The Cresson types of Hymenoptera. — Mem. Am. ent. Soc. 1: 1—141.

Dalla Torre, C. G. de, 1897. Fossores (Sphegidae). — Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus 8: 1—749.

Evans, H. E., 1959. Studies on the larvae of digger wasps (Hymenoptera, Sphecidae) part V: conclusion. — Trans. Am. Ent. Soc. 85: 137—191.

———, 1968. Notes on some digger wasps that prey upon leafhoppers. — Ann. ent. Soc. Amer. 61: 1343—1344.

Fox, W. J., 1898a. Contributions to a knowledge of the Hymenoptera of Brazil. No. 3. Sphegidae (sens. lat.). — Proc. Acad. nat. Sci. Philad. 1897: 373—379.

———, 1898b. The species of *Psen* inhabiting America North of Mexico. — Trans. Am. ent. Soc. 25: 1—18.

Gittins, A. R., 1969. Revision of the nearctic Psenini (Hymenoptera: Sphecidae). I. Redescriptions and keys to the genera and subgenera. — Trans. Am. ent. Soc. 95: 49—76.

Kohl, F. F., 1896. Die Gattungen der Sphegiden. — Annln naturh. Mus. Wien 11 (3—4): 233—516, pls. 5—11.

Krombein, K. V., 1949. An annotated list of wasps from Nags Head and the Kill Devil Hills (Hymenoptera Aculeata). — J. Elisha Mitchell scient. Soc. 65 (2): 262—272.

———, 1951. In: C. W. F. Muesebeck, K.V. Krombein and H. K. Townes. Hymenoptera of America North of Mexico. — U.S. Dep. Agric., Agric. Monograph 2: 1—1420.

———, 1953. Kill Devil Hill wasps, 1952. — Proc. ent. Soc. Wash. 55 (3): 113—135.

———, 1954. A list of wasps collected in Florida, March 29 to April 5, 1953, with biological annotations (Hymenoptera, Aculeata). — Proc. ent. Soc. Wash. 56 (5): 225—236.

———, 1958. Hymenoptera of America North of Mexico. — U.S. Dep. Agric., Agric. Monograph 2 (first supplement): 1—305.

———, 1964. Results of the Archbold Expeditions. No. 87. Biological notes on some Floridian wasps (Hymenoptera, Aculeata). — Amer. Mus. Novitates 2201: 1—27.

———, 1967. In.: K. V. Krombein & B. D. Burks. Hymenoptera of America North of Mexico. — U.S. Dep. Agric., Agric. Monograph 2 (second supplement): 1—584.

Lith, J. P. van, 1976. *Pluto rufibasis* (Malloch) (Hymenoptera, Sphecidae, Psenini). — Ent. Ber. Amst. 36: 154—158.

Malloch, J. R., 1933. Review of the wasps of the subfamily Pseninae of North America (Hymenoptera: Aculeata). — Proc. U.S. natn. Mus. 82: 1—60, pls. 1—2.

Mickel, Clarence E., 1918. A synopsis of the Sphecoidea of Nebraska (Hymenoptera). — Univ. Nebr. Stud. (1917) 17: 342—456.

Pate, V. S. L., 1937. The generic names of the Sphecoid wasps and their type species (Hymenoptera: Aculeata). — Mem. Amer. ent. Soc. 9: 1—103.

———, 1946. On the Psenine wasps of Cuba (Hymenoptera: Sphecidae). — Mems. Soc. Cubana Hist. nat. 18 (1): 3—10.

Persson, P. I., 1971. "Eugenies resa". Localities, dates and labels of the insects collected during the voyage around the world by the Swedish frigate "Eugenie" in the years 1851—1853. — Ent. Tidskr. 92: 164—172.

Rohwer, S. A., 1910. Descriptions of new Psenid wasps from the United States (Hymenoptera; Psenidae). — Proc. ent. Soc. Wash. 12: 99—104.

Smith, F., 1856. Catalogue of Hymenopterous insects in the collection of the British Museum, Part IV. Sphegidae, Larridae and Crabronidae: 207—497.

Smith, H. S., 1908. The Sphegoidea of Nebraska. — Univ. Nebr. Stud. 8: 323—410.

Stephens, J. F., 1829. A systematic catalogue of British insects: XXXIV, 1—416, 1—388. Baldwin & Cradock, London.

Viereck, H. L., 1901. New species of the subfamily Pseninae. — Trans. Amer. ent. Soc. 27: 338—342.

INDEX

The names of new species and subspecies are marked with an asterisk

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A REVISION OF THE SUBFAMILY ZELINAE AUCT. (HYMENOPTERA, BRACONIDAE)

by

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Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands

With 900 text-figures

Abstract

The subfamily Zelinae, as defined by Mason (1973) and Van Achterberg (1976b), is revised. The genera *Zele, Homolobus* and *Charmon* are redefined, the genus *Zele* is separated from the Zelinae auct. and is added to the Euphorinae-Meteorini as a senior synonym of *Zemiotes*. The remaining group of genera is renamed Homolobinae, including two tribes, Homolobini tribus nov. and Charmontini tribus nov. In the Homolobinae two new genera from the New World, *Exasticolus* and *Charmontia*, are described. For the first time the genera *Zele, Homolobus* and *Charmon* are fully revised, keyed and illustrated and a subgeneric division of *Homolobus* is proposed. Of the total of 61 valid species, 32 are newly described, while in addition 32 new combinations and 34 synonyms are proposed.

Contents

INTRODUCTION

When, in 1975, I started upon a revision of the Macrocentrinae (except for *Macrocentrus* s.s.), I soon discerned the need for a revision of the Zelinae auctorum because of the mixing of both groups and the lack of modern keys, even of so small and common a genus as *Charmon* Haliday. An unexpectedly large number of changes proved to be necessary to bring the taxonomy up-to-date. A total of 34 new synonyms and 32 new combinations are proposed. Some of the most important changes are the synonymy of *Zele* Curtis with *Zemiotes* Foerster, its removal from the Zelinae auctorum, its inclusion in the Meteorini of the Euphorinae and the renaming of the Zelinae auct. as Homolobinae. The large number of undescribed species in the genus *Homolobus* was unexpected, because they are comparatively large insects. Their nocturnal habits may be one of the main reasons of their rarity in collections, because hymenopterists usually do not collect at light.

The number of valid species of *Homolobus* is in this paper increased from 18 to 43 species, while I have seen additional new species which have to remain undescribed because of the lack of well prepared specimens. The number of new species in the other genera is lower and the increase in the number of valid species varies from 50—57%, while in the genus *Zele* Curtis a large number of new synonyms are proposed. The total number of valid species in the groups treated in this paper is increased from 29 to 61, or more than doubled.

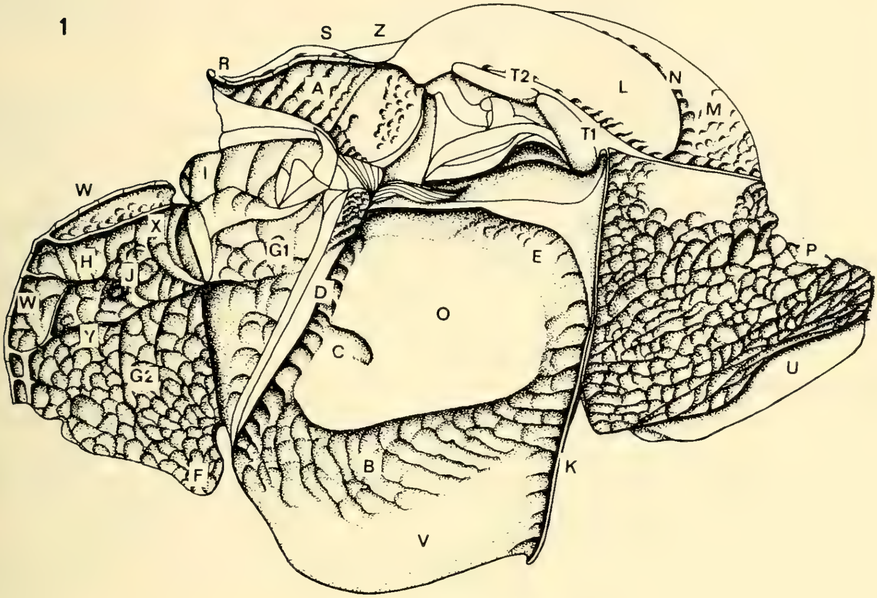
I have illustrated all species in a comparative way to enhance the chance of an unambiguous identification by workers without access to a reference-collection. Any student has to be aware of possible artificial differences as a result of illustrating from slightly different angles (as with, e.g., the frontal aspect of the head), due to the different ways in which the specimens have been mounted.

Of interest to the biological control of pests is the large number of parasites of pest species of Lepidoptera included in this revision, but more research has to be conducted before a start can be made with their application. Because Shenefelt (1965, 1969, 1970) has given excellent lists of the pertinent literature, I refer only to the original publications, to Shenefelt's catalogue and to the (usually) more recent literature not included by Shenefelt. To facilitate identification per region, keys to species of *Homolobus* per region were inserted after the descriptions.

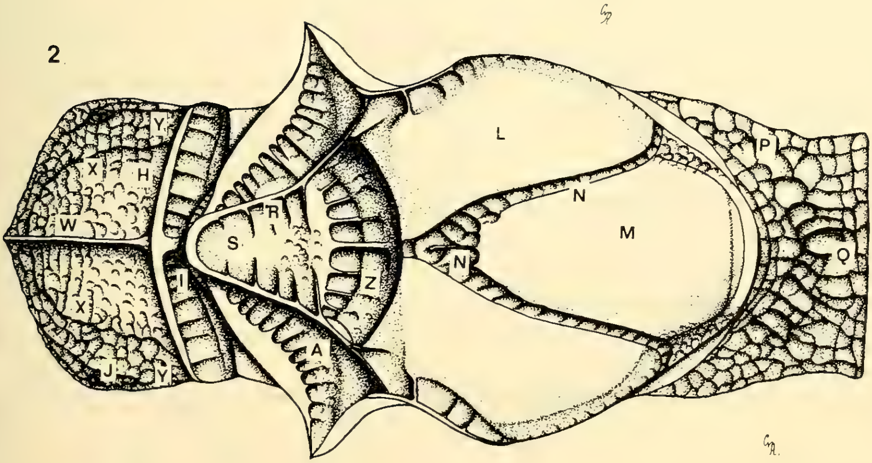
TERMINOLOGY

The morphological terms used (figs. 1—18) largely follow Richards (1956, 1977) and for the wing venation I have used a modified Comstock-Needham system

1



2



Figs. 1—2, mesosoma of *Blacus (Ganychorus) pallipes* Haliday, ♀, Netherlands, Wijster, legs and wings removed. 1, lateral aspect; 2, dorsal aspect. A = side of scutellum and axilla; B = precoxal suture; C = episternal scrobe; D = pleural suture; E = epicnemial area; F = metapleural flange; G1 = anterior part of metapleuron; G2 = posterior part of metapleuron; H = propodeum; I = metanotum; J = propodeal spiracle; K = prepectal carina; L = lateral lobe of mesoscutum; M = middle lobe of mesoscutum; N = notauli; O = mesopleuron; P = pronotum; Q = pronope; R = lateral carina of scutellum; S = scutellum; T1 + T2 = tegula and humeral plate, respectively; U = propleuron; V = mesosternum; W = medial carina of propodeum; X = lateral carina of propodeum; Y = pleural carina; Z = scutellar suture. 75 ×

based on the proposals of Eady (1974) and Sigwalt (1977). For a comparison with the modified Jurinean system I used before, see table 1. The following modifications of the Comstock-Needham system (as applied to the Braconidae by Eady (1974)) are proposed:

i) the abbreviations of the longitudinal veins are completely written in capitals ("CU" in stead of "Cu"), additional letters to indicate a certain part are in lower case letters (e.g., CU1a). The abbreviations of the true transverse veins are (as in the original Comstock-Needham system) wholly in lower case letters.

ii) the abbreviations are derived from Latin names of the veins. Thus SR (from "sectio radii") and not Rs (from "radial sector") of Eady and others.

iii) the prefix "1-", "2-", "3-", etc. is added to indicate the 1st, 2nd, 3rd, etc. abscissa of a vein. This should not be confused with a cipher without minus-sign in front of an abbreviation, this indicates which vein is involved. E.g., 2r-m is the second transverse vein between the radius and the media, while 2-SR indicates the second abscissa of the longitudinal vein SR. For the application of this system to the genera revised in this paper, see figs. 15—18. Some abbreviations are extra short for practical reasons: r-m of fore wing is actually 2r-m + SR2, except, with certainty, in the Neoneurinae where SR2 branches off distad from 2r-m; an apomorphous state as shown, e.g., by the hypothetical ancestral hymenopterous wing proposed by Ross (1937). Normally 1r-m is absent in the fore wing of the Braconidae, because it disappeared with the anastomosis of SR with M. But in, e.g., the freak-type of fore wing of *Alysia ridibunda* (Say) (fig. 2 in Riegel, 1948) 1r-m is still visible. This vein was wrongly interpreted by Riegel as 2r-m and resulted in his anomalous nomenclature of r-m as 3r-m. The real transverse vein 3r-m is absent in the Braconidae and its sister-group Ichneumonidae. Transverse vein r of fore wing is actually 2r but 1r is normally absent in the fore wing of the Braconidae, while cu-a of hind wing is actually 1-CU + cu-a, but if it is no longer recognizable (as in most subfamilies of Braconidae) it is abbreviated as cu-a.

For the following terms used, an additional explanation may be useful:

Antescutal depression: transverse depression between dorso-anterior part of pronotum and middle lobe of mesoscutum (figs. 168, 316).

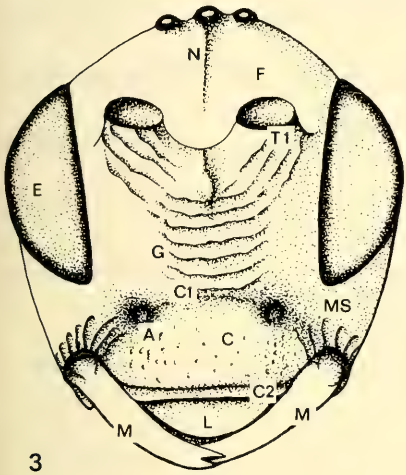
Diplope: distinct laterope and dorsope more or less touching each other (fig. 843).

Dorsope: antero-dorsal depression of the 1st metasomal tergite, more or less pit-

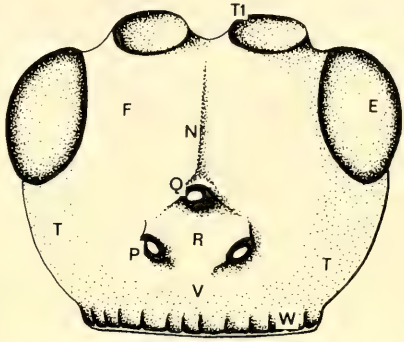
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Figs. 3—8, *Blacus (Ganychorus) pallipes* Haliday, same specimen as in fig. 1. 3, frontal aspect of head; 4, dorsal aspect of head; 5, apex of metasoma, lateral aspect; 6, fore tarsus, lateral aspect; 7, lateral aspect of head; 8, 1st metasomal tergite, dorso-lateral aspect. A = anterior tentorial pit; B = basitarsus; C = clypeus; C1 = epistomal suture; C2 = clypeal margin; D = dorsope; E = eye; F = frons; G = face; H = hypopygium; I = dorsal carinae; J = laterope; K = glymma; L = labrum; M = mandible; N = frontal suture; O = ovipositor; P = posterior ocellus; Q = anterior ocellus; R = stemmaticum; S = ovipositor sheath; T = temple; T1 = antennal socket; U = occipital flange; V = vertex, W = occipital carina; X = spiracle of 1st metasomal tergite; Y = tarsal claw; Z = telotarsus; AD = anterior muscle or adductor of 1st metasomal tergite; AN = annellus; MS = malar space; PA = postannellus or 3rd antennal segment; PD = pedicellus or 2nd antennal segment; RA = radix; SC = scapus or 1st antennal segment. 64 ×

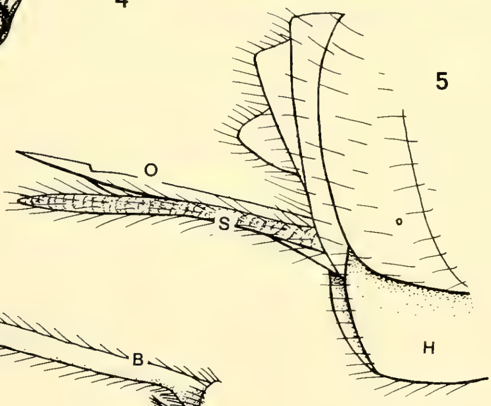
shaped, situated between the more or less developed dorso-lateral carina and the dorsal carina (figs. 8, 852; Van Achterberg. 1974c: 213).



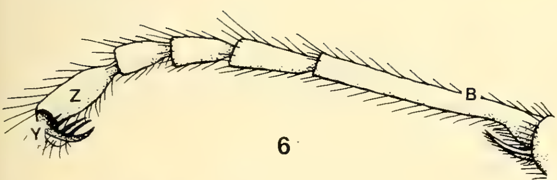
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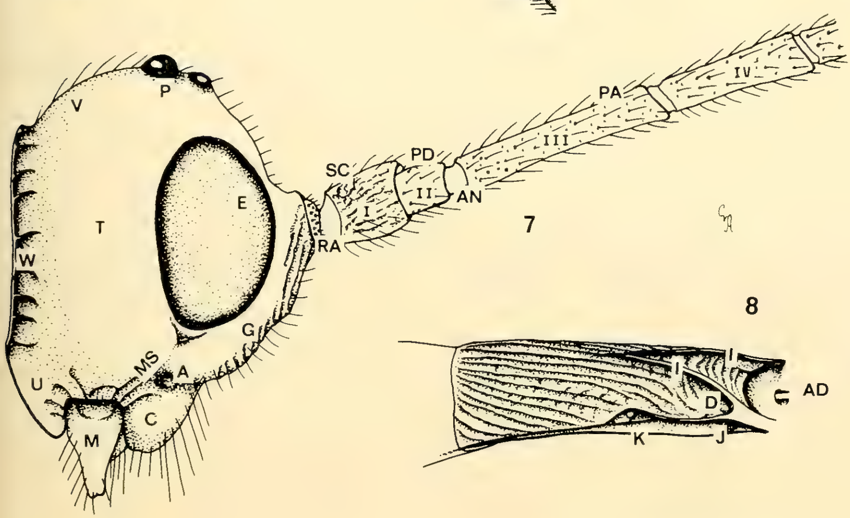
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Height: maximum height, unless otherwise stated; for the height of the head, see fig. 10.

Inclivous: transverse vein of which the anterior end is nearer to the wing base than its posterior end.

Laterope: antero-dorsal depression of the 1st metasomal tergite, more or less pit-shaped, situated in the glymma below the more or less developed dorso-lateral carina (figs. 8, 815).

Length of 3rd antennal segment: for convenience' sake the length of the annellus is included.

Length of fore wing: measured from apex of humeral plate to apex of fore wing (Van Achterberg, 1976a: fig. 15).

Length of 1st metasomal tergite: measured from posterior margin of anterior muscle to its apex (fig. 14).

Length of malar space: shortest distance between eye and condylus of mandible (fig. 9, M).

Length of ovipositor sheath: linear length of maximal visible part.

Malar suture: suture (usually shallow) between under edge of eye and base of mandible.

Mesosoma: thorax of most authors, but because of the fusion of the 1st abdominal segment (propodeum or epinotum) with the thorax, I prefer the term "mesosoma". The mesosoma is the part of the body between the 1st and 2nd strong constriction.

Metasoma: following Michener (1944), it is defined as the part of the body after the 2nd strong constriction in the Apocrita. It is usually called the abdomen or gaster; for a discussion on the confusing nature of these terms in the parasitic Hymenoptera, see Van Achterberg (1976a: 166).

OOL: distance between posterior ocellus and eye as measured in fig. 12.

Plical lobe or cell: anal (or vannal) lobe/cell of most authors (Brothers, 1975: 520).

Pronope: a medio-dorsal pit of the pronotum (fig. 2).

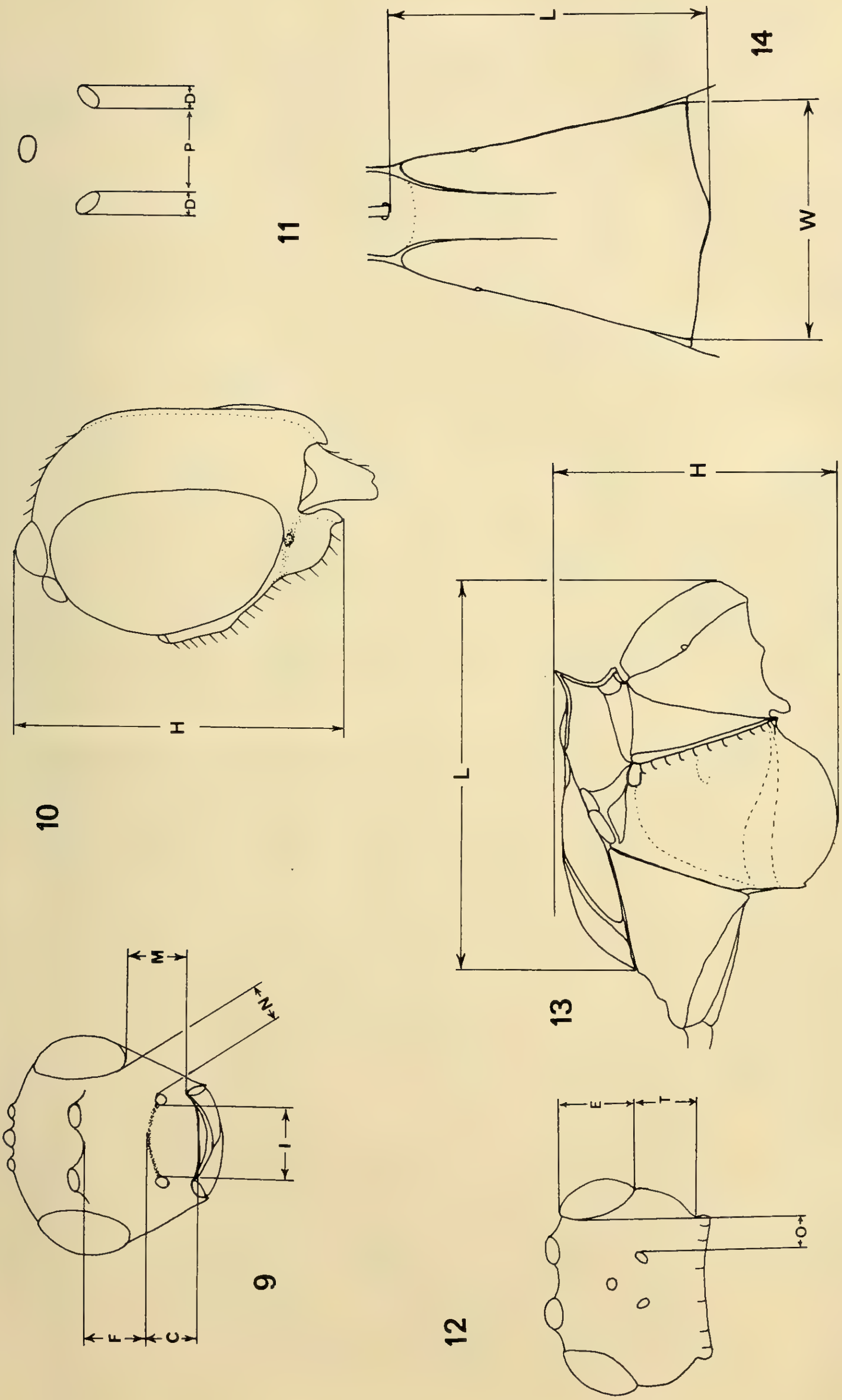
POL: distance between the posterior ocelli (fig. 11).

Reclivous: transverse vein of which the anterior end is further removed from the wing base than its posterior end.

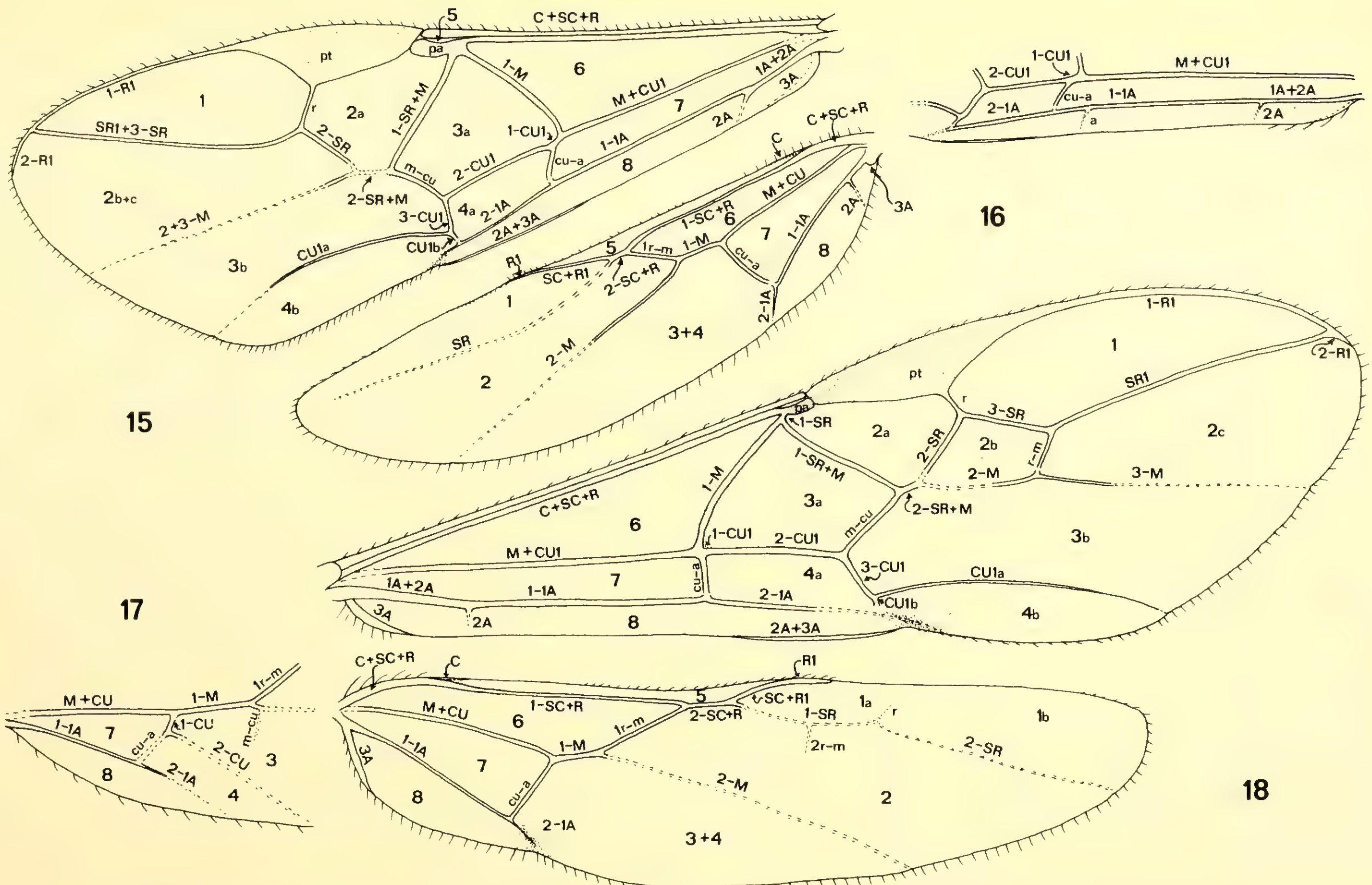
Width: maximum width, unless otherwise stated.

DISTRIBUTION

As shown in the tables 2 and 3, the genus *Homolobus* Foerster (comprising the subgenera *Apatia*, *Chartolobus*, *Homolobus*, *Phylacter*, and *Oulophus*) is cosmopolitan, the genus *Zele* Curtis is widely distributed (but is absent in the Australian and Afrotropical regions, and scarcely represented in the Oriental region), the new genus *Exasticolus* is restricted to the New World, the new genus *Charmontia* is only known from Chile, and the genus *Charmon* Haliday occurs in the Holarctic, Afrotropical, Oriental, and Australian regions. According to Mason (1973: 215) the genus *Zele* Curtis (*Zemiotes* in his paper) is restricted to the Holarctic region, but as reported in this paper, the genus *Zele* is also present in the Neotropical and



Figs. 9—14. 9, head, frontal aspect; 10, head, lateral aspect; 11, stemmaticum; 12, head, dorsal aspect; 13, mesosoma, lateral aspect; 14, 1st metasomal tergite, dorsal aspect. C = height of clypeus; D = diameter of posterior ocellus; F = height of face; H = height; I = inter-tentorial distance; L = length; M = malar space; N = tentorio-ocular distance; O = ocular-ocellar line; P = postocellar line; W = width



Figs. 15—18, nomenclature of the wing venation according to the modified Comstock-Needham system. A = analis; C = costa; CU = cubitus; M = media; R = radius; SC = subcosta; SR = sectio radii; a = transverse anal vein; cu-a = transverse cubito-anal vein; m-cu = transverse medio-cubital vein; r = transverse radial vein; r-m = transverse radio-medial vein; pa = parastigma; pt = pterostigma. Cells: 1 = marginal cell; 2 = submarginal cell; 3 = discal cell; 4 = subdiscal cell; 5 = costal cell; 6 = basal cell; 7 = subbasal cell; 8 = plical cell or (if protruding) lobe; a, b, and c indicate 1st, 2nd and 3rd cell, respectively

Table 1. Comparison of modified Jurinean system and modified Comstock-Needham system (figs. 15—18).

Modified Jurinean System			Modified Comstock-Needham System		
Fore wing	**Hind wing**	**Abbreviations**	**Fore wing**	**Hind wing**	
costa	costella/subcostella	c	C+SC+R	C+SC+R/C/SC+R	
media	mediella	m	M+CU1	M+CU/M	
submedia	submediella	sm	1A+2A/1A	1A	
basalis	basella	b	1-M	1r-m	
nervulus	nervellus	nv	cu-a	cu-a	
vein for attachment of hamuli	---	-	2A+3A	--	
1st transverse anal vein	1st transverse anellan vein	aqu 1	2A	2A	
2nd transverse anal vein	---	aqu 2	a	--	
1st abscissa of discoideus	---	d 1	1-CU1	--	
2nd abscissa of discoideus	---	d 2	2-CU1	--	
basal abscissa of subdiscoideus	(sub)discoidella	s 1a	3-CU1	2-CU	
apical abscissa of subdiscoideus	---	s 2	CU1a	3-CU	
---	---	s 1b	CU1b	--	
parastigma	---	p	pa	--	
pterostigma	pterostigma (normally absent)	pt	pt	pt	
metacarpus	metacarpella	mc	R1	R1	
1st abscissa of radius (r1)	transverse radiellan vein	rqu	r	r	
2nd abscissa of radius (r2)	radiella	r	3-SR	SR1	
3rd abscissa of radius (r3)			SR1		
1st transverse cubital vein	transverse cubitellan vein	cuqu 1	2-SR	2r-m	
2nd transverse cubital vein	---	cuqu 2	r-m	--	
1st abscissa of cubitus (cu1)	cubitella	cu	1-SR+M	2-M	
2nd abscissa of cubitus (cu2)			2-SR+M		
3rd abscissa of cubitus (cu3)			2-M		
4th abscissa of cubitus (cu4)			3-M		
---	postnervellus	pn	--	m-cu	
radial cell	radiellan cell	R	marginal cell	marginal cell	(1)
1st, 2nd, 3rd cubital cells	cubitellan cell	CU	1st, 2nd, 3rd submarginal cells	submarginal cell	(2)
1st, 2nd discoidal cells	discoidellan cell	D	1st, 2nd discal cells	discal cell	(3)
1st, 2nd brachial cells	---	B	1st, 2nd subdiscal cells	subdiscal cell	(4)
costal cell	costellan cell	C	costal cell	costal cell	(5)
medial cell	mediellan cell	M	basal cell	basal cell	(6)
submedial cell	submediellan cell	SM	subbasal cell	subbasal cell	(7)
anal cell	(v)anellan cell or lobe	A	plical cell	plical cell or lobe	(8)

Oriental regions. The genus *Zele* is (as shown by the character-states of the species) of Holarctic origin and its largest speciation has taken place there.

The situation in *Homolobus* is more complicated. There are two subgenera, *Phylacter* Reinhard and *Homolobus* Foerster, which have restricted distributions. *Phylacter* is restricted to the Palaearctic region, with one species in the intermediate area between the Palaearctic and Oriental regions. The subgenus *Homolobus* is restricted to the Palaearctic and Afrotropical regions, and, considering the distribution of the apomorphous character-states among the species, it has also a Palaearctic origin.

The subgenus *Apatia* Enderlein has its centre of speciation in the Afrotropical region, where also the species with the largest number of plesiomorphous character-states occur. The only species outside the Afrotropical region with a peculiar plesiomorphous character-state (viz., the presence of vein r in the hind wing) is *H. (A.) elagabalus* (Nixon) from the Oriental region. Three other species of *Apatia* show a remarkably wide distribution. This distribution may have resulted (partly) from human activities, but this seems unlikely, because, e.g., a species (*H. (A.) australiensis*) may have evolved in Australia from *H. (A.) ophioninus* (Vachal), itself probably originating from Africa. Another curious distribution is shown by a species of the new subgenus *Chartolobus*; *H. (C.) infumator* (Lyle) occurs in the Holarctic region, but has also reached the Neotropical (viz., the Andes) and the Oriental regions. Or, if considered to originate from the Oriental region, it has

Table 2. Number of revised species occurring in only one zoogeographical region.

Region \ (Sub)genus	*Exasticolus*	*Apatia*	*Chartolobus*	*Homolobus*	*Phylacter*	*Oulophus*	*Charmon*	*Zele*	*Charmontia*
Palaearctic (Himalayan area included)	–	–	–	3	3	5	–	3	–
Nearctic	–	–	–	–	–	4	–	3	–
Neotropical	2	–	–	–	–	4	–	2	1
Afrotropical	–	9	–	4	–	–	–	–	–
Oriental (Himalayan area excluded)	–	1	–	–	–	1	–	–	–
Australian	–	1	1	–	–	–	1	–	–

dispersed to the Holarctic and Neotropical regions. The origin of *Chartolobus* may be in the Oriental region, but this is uncertain with the information available at present. The new subgenus *Oulophus* is a relatively large group of species, including species with comparatively large number of plesiomorphous character-states, which occur in the South Nearctic and East Palaearctic areas. This may reflect the original Holarctic primary speciation of this group. Unfortunately, there are no fossil remains known of the Homolobinae to test the suggestions put forward in this papier. The new genus *Exasticolus* contains two sparsely collected Neotropical species and one widely distributed and rather common species, which has penetrated the Nearctic as far as Canada from the Neotropical region.

The origin of *Charmon* Haliday is uncertain, but it may originate from the Palaeotropics, from where it occupied the Palaearctic and, subsequently, the Nearctic regions. Some support for this hypothesis lies in the absence of *Charmon* in the Neotropical region and its presence in New Guinea. The new species from New Guinea shows a plesiomorphous condition of the wing venation, if compared with both other species. Interesting is the presence of the closely related new genus *Charmontia* in Chile with a larger number of plesiomorphous character-states than *Charmon*.

PHYLOGENY

In constructing a phylogenetic classification it is necessary to find synapomorphous character-states. The terms apomorphous and plesiomorphous character-states are here used to indicate, respectively, a comparatively high or low degree of divergence from an ancestral state in respect to each other. The first object has to be the defining of monophyletic groups and their sister-groups by synapomorphous character-states. The interpretation of the relative apo- and

Table 3. Number of revised species occurring in more than one zoogeographical region.

Combined region \ (Sub)genus +)	*Exasticolus*	*Apatia*	*Chartolobus*	*Oulophus*	*Charmon*	*Zele*
Holarctic	-	-	-	1	-	2
New World	1	-	-	1	-	-
Holarctic, Neotropical & Oriental	-	1	1	-	-	-
Holarctic & Afrotropical	-	-	-	-	2	-
Afrotropical, Palaearctic & Australian	-	1	-	-	-	-
Indo-Australian	-	-	1	-	-	-
Holarctic & Oriental	-	-	-	-	-	1
Palaearctic, Afrotropical & Oriental	-	1	-	-	-	-

+) The subgenera not mentioned are restricted to one zoogeographical region.

plesiomorphous character-states is based on the general hypotheses of the evolution in the Hymenoptera (as compiled by Königsmann, 1976—1978) and in the Braconidae (Van Achterberg, 1976b).

The synapomorphous character-states of the sister-groups Homolobinae and Orgilinae combined (group E, Van Achterberg, 1976b: 51) are: 1—vein a of fore wing absent; 2—vein m-cu of fore wing far antefurcal; 3—labial sclerite of larvae transverse; 4—epistomal arch and hypostoma of larvae absent; 5—endoparasites of larvae of Lepidoptera; 6—tendency to loose the dorsal carinae of the 1st tergites.

The synapomorphous character-states of the Homolobinae (Homolobini and Charmontini combined) are: 1—antescutal depression present; a character-state found almost exclusively in the Homolobinae as defined in this papier but see note below about the Agathidinae; 2—1st tergite more or less narrowed behind the spiracles, a tendency also present in the Orgilinae (e.g., genus *Microtypus*); 3—1st discal cell of fore wing (sub)sessile and vein 1-SR absent or nearly so, but shortly developed in the genus *Charmontia* (fig. 892); 4—metapleural flange more or less lamelliform and transparent; 5—prepectal carina (almost always) reaches the anterior margin of the mesopleuron.

The apomorphous character-states of the tribe Homolobini, with regard to its sister-group, the tribe Charmontini, are: 1—lateral carina of mesoscutum lamelliform; the plesiomorphous condition in the Ichneumonoidea is probably a weakly developed, non-lamelliform lateral carina; 2—apical segment of antenna with a well developed spine; 3—vein 2A of hind wing absent; 4—mandible twisted apically; 5—vein 2-R1 of fore wing absent.

The apomorphous character-states of the tribe Charmontini, with regard to its sister-tribe, are: 1—vein r-m of fore wing absent; 2—occipital carina reduced medio-dorsally; 3—claws simple, without a subapical tooth; 4—precoxal suture absent; as pointed out by Königsmann (1977: 3) the presence of the precoxal suture has to be considered the plesiomorphous condition in the Hymenoptera; 5—middle lobe of mesoscutum more or less truncate anteriorly and with a transverse protruding horizontal part (fig. 60); this resembles the development in the Macrocentrinae, but differences in other characters (e.g., prepectal carina, trochantelli, pronope) indicate that this is very likely a convergent development; 6—marginal cell of hind wing narrowed distally; as shown, e.g., by the hind wing of the saw-fly *Macroxyela ferruginea* (Say), the plesiomorphous character-state is a medially widened marginal cell; the hind wing of *M. ferruginea* (Say) is one of the most completely venated hind wings known in the Hymenoptera; 7—absence of the lateral carina of the mesoscutum in front of the tegulae; in the Ichneumonoidea a non-lamelliform carina probably is the plesiomorphous condition; 8—apical margin of clypeus with a more or less developed row of punctures.

The apomorphous character-states of the genus *Charmon*, with regard to its sister-group *Charmontia*, are: 1—third segment of labial palp reduced; 2—scutellum smooth medio-posteriorly. Because the great majority of the species of the Homolobinae have this area sculptured, it is likely that the reduction of the sculpture is an apomorphous condition in the Charmontini.

The apomorphous character-states of the genus *Charmontia*, with regard to its sister-group, are: 1—claws (except for the apical tooth) straight ventrally; 2—1st tergite slender (fig. 896); 3—propodeal spiracle situated submedially in propodeum.

The apomorphous character-states of the genus *Exasticolus*, with regard to its sister-group. *Homolobus*, are: 1—inner aspect of apex of hind tibia with a comb of bristles; 2—vein 1-SR + M of fore wing curved distad; 3—tarsi with a weakly developed row of setae ventrally; 4—the selection of Lasiocampidae as hosts, a group of Lepidoptera not attacked by the other Homolobinae according to the available data.

The apomorphous character-states of the large diverse genus *Homolobus*, with regard to its sister-group, are not well to define with the available set of characters. There are some tendencies to apomorphous states (as depicted in fig. 19), which made it possible to divide the genus *Homolobus* in five subgenera. The isolated position of *Exasticolus* as a genus (and not as a subgenus of *Homolobus*) may be caused mainly by the isolation of the parental stock of *Exasticolus* in South America for a long period, combined with the change to another family of hosts.

In sharp contrast the apomorphous character-states of the genus *Zele* Curtis are as follows: 1—1st tergite petiolate; 2—spiracle of 1st tergite situated submedially; 3—mesopleuron more or less protruding antero-dorsally; 4—mandible with a pair of (more or less) protruding, thin carinae; 5—1st subdiscal cell of fore wing narrowly open postero-distally because of the reduction of vein CU1b; 6—mandible of larva without teeth, bare; 7—claws with a large submedial lobe;

8—vein m-cu of fore wing more or less antefurcal; 9—lateral carina of mesoscutum lamelliform; 10—mandible twisted apically; 11—vein a of fore wing absent; 12—metapleural flange more or less lamelliform.

It is clear, after comparing both lists of apomorphous character-states of *Zele* Curtis (= *Zemiotes* Foerster) and of *Homolobus* Foerster, respectively, that *Zele* is not likely to be a sister-group of *Homolobus* (= *Zele* auct.) as proposed by Mason (1973). The first seven apomorphous character-states mentioned for *Zele* Curtis are not shared by *Homolobus*, but are well matched in at least some of the species of the genus *Meteorus* Haliday s.s. I do not hesitate to depart from Mason's view and consider the genus *Zele* Curtis a sister-group of the genus *Meteorus* Haliday, both forming the tribe Meteorini Cresson of the subfamily Euphorinae. The argument put forward by Mason (1973) is based on the faulty premise that he considered "the possibility of *Zemiotes* being ancestral to *Meteorus* or vice versa". What really has to be considered, however, is the possibility that *Meteorus* Haliday s.s. and *Zele* Curtis (*Zemiotes* of Mason) have a common ancestor. The group defined by synapomorphous character-states has to include all descendants of this common ancestor, to avoid defining para- and polyphyletic groups. Of the characters used by Mason to unite *Zele* Curtis and *Homolobus* Foerster probably not one is an apomorphous character-state! My view is supported by the existence of species of *Meteorus* which are very close to *Zele* in all characters used to separate both genera.

Mason (1973: 214) argues that because *Meteorus* and *Zele* have different combinations of character-states they are not closely related. But, in my opinion, the character-states he uses to separate the two genera are plesiomorphous and cannot be used either to separate the genera upon phylogenetic grounds or to justify their inclusion in different subfamilies. The existence of two closely related genera with different sets of plesiomorphous character-states is easy to accept if a different path of further evolution for both genera (as is most likely) is assumed. The existence of intermediate *Meteorus* specimens connects both groups. As pointed out by Huddleston (in litt.) at least males of the European *Meteorus abdominator* (Nees) are intermediate in the degree of setosity of the metasomal tergites. In this species rather wide bands of setae occur in the males, which are almost equal in extent to the bands of setae in smaller species of *Zele*, e.g., *Zele caligatus* (Haliday). Also the marginal cell of the hind wing of *Meteorus abdominator* (Nees) and of a new species from India (DZD) is not distinctly narrowed distad, also showing an intermediate character-state, indicating the relationship of *Zele* and *Meteorus*. The anteriorly situated transverse carina of the propodeum (fig. 824) in *Zele* occurs also in *Meteorus* s.s., but not in the Homolobinae as defined in this paper.

Because of the synapomorphous character-states of the genera *Exasticolus* and *Homolobus* on the one hand (the tribus Homolobini) and the genera *Charmon* and *Charmontia* on the other (the tribus Charmontini) I consider the two tribes to be sister-groups.

The placement of the genus *Charmon* by previous authors varied; Tobias (e.g., 1976: 31) and Čapek (1973: 264) included *Charmon* in the subfamily Mima-

gathidinae (a junior synonym of Orgilinae Ashmead). This was still rejected by Čapek in 1969 (p. 308), who included the genus *Charmon* (as *Eubadizon*) in his Macrocentrinae basing his conclusion on a detailed study of the larval characters. Additionally the emergence opening of the cocoon is regular in shape by removing a cap at one end of the cocoon in the genera *Homolobus* and *Charmon*, while in the Orgilinae s.s. the emergence opening is irregular (Čapek, 1970: 853). Actually Čapek (1970: 850) considered *Macrocentrus, Homolobus* (as *Zele* auct.) and *Charmon* (as *Eubadizon* auct. p.p.) to be closely related. As pointed out above, and earlier (Van Achterberg, 1976b: 37), I agree with Čapek's view about a close relationship between *Homolobus* and *Charmon*, but I have to disagree about a close relationship with the Macrocentrinae s.s. Most of the complex of synapomorphous character-states of the Macrocentrinae s.s. are not shared by the Homolobinae. Thus the sister-group of the Homolobinae is more likely to be formed by the Orgilinae s.s. (together forming group E of Van Achterberg, 1976b: 51, fig. 123). Both have the larval labial sclerite transverse and the epistomal arch and dorsal part of the hypostoma absent, or at least unsclerotized. The genus with most of the plesiomorphous character-states in the Orgilinae is *Microtypus* Ratzeburg. The adults share the following synapomorphous character-states with the Homolobinae: 1—1st tergite somewhat constricted behind the spiracles; 2—reduction of the dorsal carinae of the 1st tergite; 3—reduction of the 3rd labial palp segment; 4—endoparasites of lepidopterous larvae; 5—prepectal carina reaching anterior margin of mesopleuron; 6—apex of antenna with a well developed spine; 7—1st discal cell of fore wing (sub)sessile or nearly so.

The inclusion of the Homolobinae as a tribe in the Helconinae (Watanabe, 1969: 319) is rejected because of differences of larval (Čapek, 1970: 853) and adult morphology (Van Achterberg, 1976b: 853), together with differences in their biology.

Exceptionally a shallow and narrow antescutal depression, combined with a weak constriction of the 1st tergite behind the spiracles is present in the Agathidinae, but this seems to be a parallelism, because the plesiomorphous character-states are also present in the Agathidinae. Additionally, no convincing set of synapomorphous character-states has yet been found, a necessity to validate the sister-group concept for the Agathidinae and Homolobinae, but further research may reveal such a relationship.

The evolution within the tribe Homolobini is fairly complicated. The new genus *Exasticolus* is easy to separate by two (for the subfamily unique or autapomorphous) character-states, viz., the presence of a hind tibial comb and the curved 1-SR + M in the fore wing. It may reflect the early isolation of the group on the South American continent. Additonal apomorphous character-states are the mainly smooth precoxal suture, the small 3rd labial palp segment and the short ovipositor. Its sister-group, the genus *Homolobus* Foerster, consists of several subgroups (subgenera) of which the subgenus *Apatia* Enderlein probably originated first. Remarkable characteristics of *Apatia* are the simple claws and the phenocline towards loosing the sharp apex of the hind tibial spurs of the males (figs. 709—713).

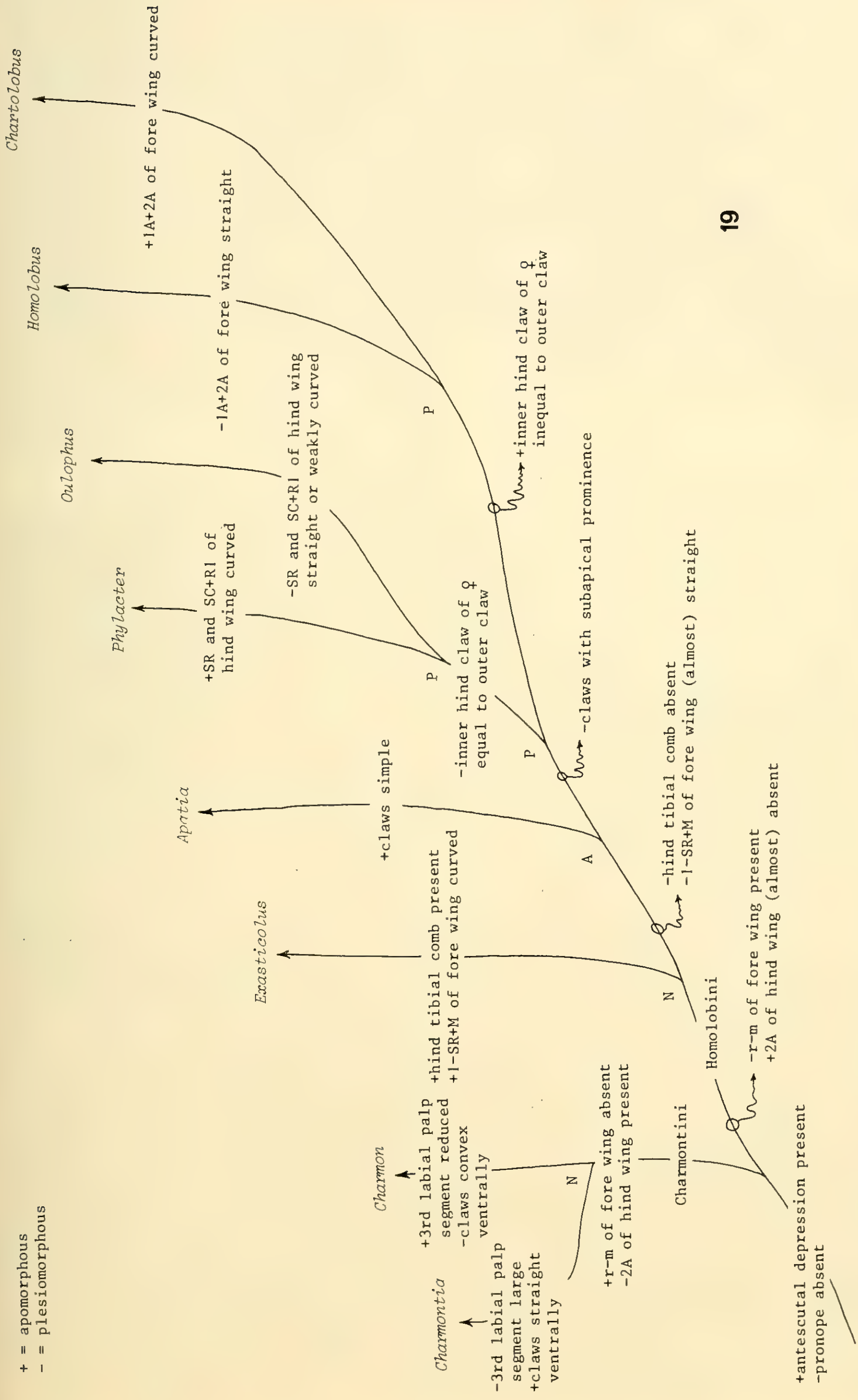


Fig. 19, dendrogram of possible relationships in the Homolobinae. The zoogeographic regions in which the primary speciation may have taken place are indicated by the following abbreviations: A = Afrotropical; N = Neotropical; P = Palaearctic

The following separations seem to have taken place in the Palaearctic region. Firstly the subgenera *Phylacter* Reinhard and *Oulophus* subgen. nov. *Phylacter* is a small group of species, related to *Oulophus* and is characterized by the strongly curved SC + R1 of the hind wing and the more or less curved base of SR of the hind wing. The new subgenus *Oulophus* is a large and rather diverse group of species, the primary speciation of which seems to have taken place in the Holarctic region. Secondly evolved the group of the subgenera *Homolobus* Foerster and *Chartolobus* subgen. nov., which is characterized by a well-developed ridge on the 3rd—9th antennal segments of the female and inequal hind claws of the female. The new subgenus *Chartolobus* is the most peculiar subgenus of *Homolobus*, because of the curved vein 1A + 2A of fore wing, together with a lamelliform ridge at the base of the antenna and peculiar inner hind claws of the female. The supposed relations in the Homolobinae are depicted in fig. 19.

BIOLOGY

All the species treated in this paper are primary endoparasites of Lepidopterous larvae; they pupate outside the host and construct a parchment-like, spindle-shaped cocoon, which is covered by some loose silk. Allen (1977: 111) reported a period of obligate ectoparasitism in *Homolobus infumator* (Lyle) after the host (*Campaea margaritata* (L.)) has spun the cocoon. The ectoparasitic phase of the final instar larvae of *H. infumator* lasted about 24 hours. During this phase the host is almost entirely devoured (only the head capsule remains), thereafter the parasite larva began to spin (slowly) its large white cocoon, taking 24—36 hours to complete this. After 17—20 days under outdoor conditions the adults were bred (Allen, in litt.). The absence of teeth at the mandibles of the final instar larvae of the Euphorinae may indicate the absence of an ectoparasitic phase, because the teeth on the mandibles of the larvae of the Homolobinae are presumably adapted to the short ectoparasitic way of life.

Many species have an ophionoid facies (body largely yellowish, slender; eyes and ocelli large and metasoma of ♀ more or less compressed apically) and are frequently captured at light. As pointed out by Gauld & Huddleston (1976: 35) larvae of many Noctuidae and of some Lasiocampidae exhibit the habit to remain concealed by day and coming out to feed at night. The nocturnal behaviour of the parasites may be an adaptation to the activity-pattern of the hosts. There is a profound difference in the host-selection between the species of the two tribes of the Homolobinae. The tribe Charmontini contains parasites of small Lepidoptera larvae with a hidden way of life, mainly in rolled and/or spun leaves, in stored products or in mines of leaves. The species of the tribe Homolobini are parasites of exposed living larvae of Lepidoptera, which may have a more nocturnal behaviour as do the adult parasites. The differences are reflected in the shape and length of the ovipositor: long and rather slender in the Charmontini, but usually short and rather stout in the Homolobini. Some species of *Homolobus* (e.g., *H.* (*O.*) *armatus* spec. nov.) have a long and slender ovipositor, which may indicate that more hidden larvae are also used as prey. Unfortunately no host records are known for

these species. I consider a long ovipositor (and the associated selection of hidden larvae as hosts) to be a plesiomorphous character-state, while the usually very short ovipositor of most Homolobini is apomorphous.

The known hosts of *Charmon cruentatus* Haliday are sparse and comprise three species of Tortricidae (*Archips rosaceana* Harris, *Grapholitha molesta* (Busck), and *Acleris variana* (Fernald)), while of *C. extensor* (L.) many hosts are known. They belong mainly to the Tortricidae (*Acleris variana* (Fernald), *A. fuscana* (?), *A. minutacinderella* (?), *A. oxycoccana* Packard, *Argyrotaenia pinatubana* Kearfott, *A. tabulana* (?), *Choristoneura murinana* (Hübner), *C. fumiferana* (Clemens), *Epinotia infuscana* (?), *Eucosma radicana* Walsingham, and *Grapholita molesta* (Busck)), Gelechiidae (*Evagora* spec., *Eucordylea atrupictella* Dietz, *Recurvaria apicitripunctella* (Clemens), *R. canusella* Chambers, *R. milleri* Busck, *R. piceaella* Kearfott, and *R. starki* Freeman), Coleophoridae (*Coleophora ulmifoliella* (?)), Oecophoridae (*Hoffmannophila pseudospretella* Stainton), Geometridae (*Operophthera bruceata* Hulst), and Pyralidae (*Dioryctria reniculella* (Grote)). Of the new genus *Charmontia* no host records are known.

Of the new genus *Exasticolus* only one host is known, viz., *Gloveria ballovi* Schaus, belonging to the Lasiocampidae. The hosts of the species of the subgenus *Apatia* of the genus *Homolobus* mainly belong to the Noctuidae and Geometridae. The Palaeotropical *H.* (*A.*) *ophioninus* (Vachal) is known to be a parasite of Noctuidae (*Spodoptera exempta* Walker and *Agrotis segetum* (Denis & Schiff.)). The closely related *H.* (*A.*) *truncatoides* spec. nov. is only known to have its host on sugar beet (*Beta*). The only known host of *H.* (*A.*) *elagabalus* (Nixon) belongs to the Noctuidae, viz. *Selepa celtis* Moore. The only species of this subgenus with many host records is *H.* (*A.*) *truncator* (Say). The hosts belong to the Noctuidae (*Agrotis segetum* (Denis & Schiff.), *A. venerabilis* Walker, *Amathes smithii* (Snellen), *Heliothis armigera* (Hübner), *Plusia gamma* (L.), *Porosagrotis orthogonia* (Morrison), *P. tristicula* (Morrison), *Prodenia ornithogalli* Guenée, *Spodoptera exigua* (Hübner), and *S. frugiperda* Smith), Geometridae (*Alsophia quadripunctata* Esper, *Erannis bajaria* (Denis & Schiff.), *E. sorditana* Hübner, *Fidonia cebraria* Tr., *F. fasciolaria* (Rottemburg), *Hypagyrtis piniata* (Packard), *Lycia zonaria* (Denis & Schiff.), and *Semiothisa bitactata* Walker), Gelechiidae (*Gnorimoschema operculella* Zeller), and Pyralidae (*Margaritia sticticalis* (L.)). An aberrant host spectrum seems to be present in the Afrotropical *H.* (*A.*) *huddlestoni* spec. nov. All four hosts belong to the Lymantriidae (*Arctornis rubricosta* Hering, *Euproctis fasciata* Walker, *E. rubricosta* Fawcett, and *E. sanguiguttata* Hampson).

The only species of the subgenus *Chartolobus* with known hosts is *H.* (*C.*) *infumator* (Lyle). They belong mainly to the Geometridae (*Alcis repandata* (L.), *Nepytia canosaria* (Walker), *Bupalus pinarius* (L.), *Campaea margaritata* (L.), *Ectropis deodarae* (?), *Ematurga atomaria* (L.), *Lambdina fiscellaria* (Guenée), *L. somniaria* (Hulst), and *Lycia zonaria* (Denis & Schiff.); additionally it has been reared from Oecophoridae (*Agonopterix alstroemeriana* (Clerck)), Noctuidae (*Orthosia stabilis* (Denis & Schiff.)), and Pyralidae (*Phycita roborella* (Denis & Schiff.)).

The only species of the subgenus *Homolobus* with host-records is *H.* (*H.*) *discolor*

(Wesmael). Probably it is a parasite of Geometridae (*Alcis repandata* (L.), *Boarmia* spec., *Cabera pusaria* (L.), *Ennomos* spec., *Eupithecia abietaria* (Goeze), *Geometra alniaria* L., *Larentia* spec., *Odontopera bidentata* (Clerck), and *Thera variata* (Denis & Schiff.)) and Noctuidae (*Acronycta aceris* L., *Lithocampa ramosa* Esper, and *Polyphaenis sericata* Esper). The host record of a Tortricid (*Zeiraphera rufimitrana* (Herrich-Schäffer)) is probably incorrect.

The only species of the subgenus *Phylacter* with host records is *H.* (*P.*) *annulicornis* (Nees). It seems to be mainly a parasite of Noctuidae (*Apamea unanimis* (Hübner), *Cosmia trapezina* (L.), *Enargia ypsillon* (Denis & Schiff.), *Eupsilia transversa* (Hufnagel), *Lithophane lamda* (F.), *Mamestra brassicae* (L.), *Mythimna obsoleta* (Hübner), *Naranga aenescens* Moore, *Orthosia populeti* (F.), *O. stabilis* (Denis & Schiff.), *Panolis flammea* (Denis & Schiff.), and *Xestia triangulum* (Hufnagel)). Additionally reared from Pyralidae (*Cnephalocrocis medinalis* Guenée, *Margaritia sticticalis* (L.), *Phycita roborella* (Denis & Schiff.)), Geometridae (*Alcis repandata* (L.), and *Alsophila aceraria* (Denis & Schiff.)), and Tortricidae. The host records of Tortricidae (*Archips rosana* L., and *Tortrix viridana* L.) are probably incorrect, considering the size of the parasite.

The only species of the subgenus *Oulophus* with known host data, viz., *H.* (*O.*) *flagitator* (Curtis), seems to be a specalized parasite of Geometridae (*Alcis repandata* (L.), *Campaea perlata* (Guenée), *Caripeta divisata* Walker, *Entephria caesiata* Lang (on *Vaccinium myrtillus* L.), *Eupithecia annulata* Hulst, *E. harrisonata* MacK., *E. longipalpata* Packard, *E. olivaceae* Taylor, *E. placidata* Packard, *E. unicolor* Hulst, *Larentia citrata* (L.), *Melanolophia* spec., *Nyctobia limitata* (Walker), and *N. nigroangulata* Strecker).

The numerous host data of the genus *Zele* indicate a wide spectrum in some species (*Z. albiditarsus* Curtis and *Z. chlorophthalmus* (Spinola)), while other species (*Z. niveitarsis* (Cresson) and *Z. caligatus* (Haliday)) seem to be restricted to one family of Lepidoptera. *Zele caligatus* (Haliday) is known from only one genus of Geometridae, viz., *Eupithecia* (*E. absinthiata* (Clerck), *E. expallidata* Doubleday, *E. filmata* Pears., *E. goossensiata* Mabille, *E. indigata* (Hübner), *E. luteata* Packard, *E. palpata* Packard, *E. satyrata* (Hübner), and *E. ?usurpata* Pears.). The host record of a Nymphalid (*Euphydryas aurinia* (Rottemburg)) is probably erroneous.

The known hosts of *Zele niveitarsis* (Cresson) belong mainly to the Pyralidae (*Acrobasis betulella* Hulst, *A. comptoniella* Hulst, *A. ostryella* (?), *A. rubrifasciella* Packard, *A. sylviella* (?), *Meroptera pravella* (Grote), *Salebria contatella* Grote, *S. subcaesiella* (Clements), and *S. virgatella* (Clements)). Additional records, which need verification are from Geometridae (*Rheumaptera hastata* (L.)) and Noctuidae (*Lithopane* spec.).

The recorded hosts of *Z. chlorophthalmus* (Spinola) belong to the Pyralidae (*Acrobasis consociella* (Hübner), *A. tumidana* (Denis & Schiff.), *Eurhodope suavella* (Zincken), *Eurrhypara coronata* (Hufnagel), *Margaritia sticticalis* (L.), *Nephopterix adelphella* (Fischer von Röslerstamm), *N. hostilis* (Stephens), *Phlyctaenodes turbidalis* (Tr.), *Phycita roborella* (Denis & Schiff.), *Poinea forficalis* (L.), and *Sylepta ruralis* (Scopoli)), Geometridae (*Angerona prunaria* (L.), *Crocallis elinguaria* (L.), *Ematurga atomaria* (L.), *Odontopera bidentata* (Clerck), and *Rheumaptera cervinalis*

(Scopoli)), Noctuidae (*Jaspidia pygarga* Hufnagel and *Metoponia koekeritziana* (Hübner)), Tortricidae (*Cnephasia communana* (Herrich-Schäffer), *Laspeyresia pomonella* (L.), *Tortrix viridana* (L.)), Lasiocampidae (*Malacosoma neustria* (L.)), Lymantriidae (*Lymantria monacha* (L.)), Arctiidae (*Spilosoma urticae* (Esper)), and Limacodidae (*Apoda avellana* (L.)).

The numerous host data concerning *Z. albiditarsus* Curtis are grouped according to the two colour-forms, to indicate their differences and similarities. The known hosts of *Z. albiditarsus* Curtis f. *deceptor* (Wesmael) belong mainly to the Geometridae (*Anticlea badiata* (Denis & Schiff.), *Catarhoe cuculata* (Hufnagel), *Chesias legatella* (Denis & Schiff.), *Chloroclysta truncata* (Hufnagel), *Colotois pennaria* (L.), *Crocallis elinguaria* (L.), *Deileptenia ribeata* (Clerck), *Enypia moillieti* (?), *Eupithecia indigata* (Hübner), *E. lariciata* (Freyer), *E. pseudotsugata* MacK., *Hydriomena caesiata* (Denis & Schiff.), *H. furcata* (Thunberg), *Ligdia adustata* (Denis & Schiff.), *Nyctobia nigroangulata* Strecker, *Odontopera bidentata* (Clerck), *Rheumaptera* spec., *Semiothisa continuaria* (Walker), *S. granitata* (Guenée), *S. liturata* (Clerck), *S. unipunctaria perplexa* (McDunnough), *S. sexmaculata* (Packard), *Spargania luctuata* (Denis & Schiff.), *Xanthorhoe fluctuata* (L.)). Other families of hosts represented are Noctuidae (*Anarta myrtilli* (L.), *Hoplodrina alsines* (Brahm), *Ipomorpha retusa* (L.), *Lacanobia oleracea* (L.), *Lithacodia pygarga* (Hufnagel), and *Syngrapha interrogationis* (L.)), Pyralidae (*Margaritia sticticalis* (L.) and *Ostrinia nubilalis* (Hübner)), Momphidae (*Mompha contortella* (?)), Tortricidae (*Acleris hastiana* (L.), *A. variana* (Fernald), *Epinotia solandriana* (L.)), and Saturniidae (*Antheraea polyphenus* Cramer).

Of the hosts of the nominate form of *Z. albiditarsus* (Curtis) comparatively more hosts belong to the Noctuidae, but this may be because of the size of the parasite. Large specimens of *Z. albiditarsus* usually belong to the nominate form and Noctuidae are frequently larger than, for instance, Geometridae. The main part of the known hosts belong to the Geometridae (*Abraxas grossilariata* (L.), *Cidaria pomonaria* (Hübner), *Eupithecia expallidata* Doubleday, *Macaria notata* (L.), *Operophthora brumata* (L.), *Rheumaptera hastata* (L.), and *Thera obeliscata* (Hübner)), and Noctuidae (*Anarta myrtilli* (L.), *Blepharita adusta* (Esper), *Dichonia aeruginea* Hübner, *Dryobotodes eremita* (F.), *Hypena proboscidalis* (L.), *Lacanobia oleracea* (L.), *L. suasa* (Denis & Schiff.), *Mamestria brassicae* (L.), *Orthosia cruda* (Denis & Schiff.), *O. gracilis* (Denis & Schiff.), *O. miniosa* (Denis & Schiff.), *O. stabilis* (Denis & Schiff.), *Panolis flammea* (Denis & Schiff.), *Polia nebulosa* (Hufnagel), and *Zale* spec.). Host records which need to be confirmed belong to the Douglasiidae (*Douglasia ocnerostomella* (Stainton)), Yponomeutidae (*Argyresthia brockeella* (Hübner)), Lyonetiidae (*Leucoptera scitella* (Zeller)), Arctiidae (*Rhyparia purpurata* (L.)), Gelechiidae (*Aristotelia brizella* (Treitschke), and *Caryocolum tricolorella* (Haworth)), Conchylidae (*Aethes francillana* (F.), and *Falseuncaria ruficiliana* (Haworth)), Pterophoridae (*Adaina microdactyla* (Hübner)), Nymphalidae (*Euphydryas aurinia* (Rottemburg)), and Tortricidae (*Semasia aemula* Schläg and *Zeiraphera griseana* (Hübner)).

KEY TO THE GENERA AND SUBGENERA OF HOMOLOBINAE AND METEORINI

1. First tergite petiolate and spiracles situated submedially (figs. 762, 775, 801); antescutal depression absent; pronope more or less developed (fig. 874); (tribus Meteorini) 9
— First tergite sessile and spiracles situated subbasally (figs. 551, 729, 747); antescutal depression present (figs. 31, 119, 168, 316); pronope completely absent; (subfamily Homolobinae) 2
2. Marginal cell of hind wing widened apicad (figs. 147, 161); vein r-m of fore wing present (fig. 180); occipital carina present medio-dorsally (fig. 95); vein 2A of hind wing absent (fig. 85) or nearly so (fig. 107); lateral carina of mesoscutum present; (tribus Homolobini) 3
— Marginal cell of hind wing narrowed apicad (fig. 37); vein r-m of fore wing absent (fig. 892); occipital carina reduced medio-dorsally (fig. 44); vein 2A of hind wing present (figs. 63, 892); lateral carina of mesoscutum absent; (tribus Charmontini) 8
3. Inner aspect of hind tibia without a comb apically (fig. 256); vein 1-SR + M of fore wing straight (fig. 258); tarsi without a ventral row of setae (*Homolobus* Foerster s.l.) 4
— Inner aspect of hind tibia with a well developed comb apically (figs. 98, 882); vein 1-SR + M of fore wing curved distad (figs. 85, 94); tarsi with a weakly developed row of setae ventrally . . . . *Exasticolus* gen. nov. (p. 271)
4. At least fore tarsal claws with a minute subapical tooth or lamella (figs. 350, 394, 443); hind tibial spurs of ♂ with a sharp, hyaline apex (figs. 710, 713) . 5
— Tarsal claws simple or nearly so, without a tooth or lamella (figs. 123, 152, 212); hind tibial spurs of ♂ sometimes without a sharp apex, spurs truncate and pigmented apically (figs. 112, 712) . . . . *Apatia* Enderlein (p. 277)
5. Submedially inner hind claw of ♀ distinctly concave ventrally (figs. 351, 439, 887, 888), its shape different from the outer claw (figs. 350, 443); antennal ridge of 3rd—6th antennal segments of ♀ strongly developed (figs. 349, 366, 424, 877, 878) 6
— Submedially inner hind claw of ♀ straight or convex ventrally (figs. 502, 679, 881), its shape similar to the outer claw (figs. 498, 678) or nearly so (figs. 570, 571); antennal ridge of 3rd—6th antennal segments of ♀ usually absent (figs. 879, 880), if present, then weakly developed 7
6. Vein 1A + 2A of fore wing curved (figs. 343, 369, 380); basal third of vein SR of hind wing curved and equally sclerotized as vein 1r-m of hind wing (figs. 349, 367, 382) . . . . *Chartolobus* subgen. nov. (p. 304)
— Vein 1A + 2A of fore wing straight (figs. 396, 419, 449); basal third of vein SR of hind wing straight or weakly curved (figs. 396, 404, 425), much less sclerotized than 1r-m (fig. 399) . . . . *Homolobus* Foerster (p. 311)
7. Basal third of vein SR of hind wing distinctly curved and sclerotized as vein 1r-m (figs. 495, 507), if intermediate (fig. 482), then claws bifurcate (fig. 488); vein SC + R1 of hind wing (rather) strongly curved (figs. 482, 495, 507) . . . . *Phylacter* Reinhard (p. 321)
— Basal third of vein SR of hind wing straight (fig. 539) or rather curved (fig. 649)

and usually less sclerotized than 1r-m (fig. 655), if exceptionally well sclerotized (figs. 618, 641), then SR of hind wing (almost) straight (fig. 641) and claws with a small subapical tooth (fig. 643) or with a lamella (fig. 629); vein SC+R1 of hind wing straight (fig. 631) or moderately curved (fig. 607) . . . . *Oulophus* subgen. nov. (p. 327)

8. Length of 3rd segment of labial palp equal to length of 2nd segment (fig. 893); 1st discal cell of fore wing petiolate (fig. 892); claws (except for the apical tooth) straight ventrally (fig. 894); apical segment of antenna without spine apically (fig. 897); scutellum weakly sculptured postero-medially (fig. 899); 1st tergite slender, its length ca. 2.8 times its apical width (fig. 896) . . . . *Charmontia* gen. nov. (p. 262)

— Third segment of labial palp absent or short, much shorter than 2nd segment of labial palp (fig. 57); 1st discal cell of fore wing (sub)sessile (figs. 37, 63); claws convex ventrally (figs. 40, 52); apical segment of antenna with spine apically (fig. 53); scutellum smooth postero-medially (fig. 43); 1st tergite comparatively stout, its length less than twice its apical width (figs. 31, 41, 70) . . . . *Charmon* Haliday (p. 263)

9. Marginal cell of hind wing widened apicad (figs. 784, 788); at least apical half of 3rd and following tergites densely setose (figs. 783, 794); vein r of hind wing present (fig. 788) or absent (fig. 758); dorsope more or less developed (figs. 762, 794) . . . . *Zele* Curtis (p. 359)

— Marginal cell of hind wing narrowed apicad or its sides are parallel; 3rd and following tergites with a few rows of setae, exceptionally more extensively setose; vein r of hind wing absent; dorsope variable . . . . *Meteorus* Haliday

Subfamily HOMOLOBINAE, nom. nov.

Syn.: Zelinae auct. p.p.

Diagnosis. — Antescutal depression present; hypoclypeal depression absent; 1st discal cell of fore wing (sub)sessile, 1-SR absent or nearly so, but in the new genus *Charmontia* present (fig. 892); dorsope of 1st tergite absent; 1st tergite sessile, more or less narrowed behind the spiracles, and spiracles situated in front of the middle of the tergite; apical segment of antenna with a well developed spine, but absent in the new genus *Charmontia* (fig. 897); occipital carina connected with the hypostomal carina above the mandibular base; vein a of fore wing absent; pronope absent; metapleural flange more or less lamelliform and transparent; prepectal carina (almost always) reaching anterior margin of mesopleuron; hypostomal and prepectal carinae present; lateral carina of scutellum absent; vein m-cu of fore wing far antefurcal to 2-SR; subbasal cell of hind wing large (figs. 26, 161); lobes of mesoscutum evenly convex; trochantelli simple, without teeth; scapus (sub)truncate apically; veins CU1b, 2-SR, and 2A of fore wing present; 1st subdiscal cell of fore wing closed distally; plical lobe of hind wing rather large; laterope of 1st tergite deep, large and subbasal; mesopleuron not distinctly protruding anteriorly; maxillary and labial palpi with, respectively, 6 and 4 segments, but 3rd labial palp segment often reduced, in the genus *Charmon* even

absent or nearly so (fig. 57); metasoma evenly setose; occipital carina present, at least laterally; postpectal carina absent; hypopygium truncate apically, large to medium-sized; antennal segments 37—55; ovipositor straight, or nearly so, and with a small subapical notch.

Distribution. — Cosmopolitan. Contains two tribes: Charmontini and Homolobini.

Tribus CHARMONTINI nov.

Diagnosis. — Occipital carina reduced medio-dorsally; tarsal claws without a subapical tooth; anterior tentorial pits deep, medium-sized or large; precoxal suture absent; middle lobe of mesoscutum more or less truncate anteriorly and with a transverse protruding horizontal part (figs. 20, 60); vein 2A of hind wing present; marginal cell of hind wing narrowed apicad; mandibles normal, not twisted apically; vein 2-R1 of fore wing well developed (figs. 15, 892); hind tibial spurs subequal, rather short, 0.2—0.4 times length of hind basitarsus; vein r-m of fore wing absent (fig. 15); ventral margin of clypeus rather thick, not separated from clypeus, and with a more or less developed row of punctures (fig. 898); eyes bare and immarginate, medium-sized; frons and vertex smooth; face rather flat; metapleural flange present as a narrow, rather thin and rounded ventral carina (fig. 32); mesopleuron smooth or nearly so; 1st tergite concave medio-basally and convex submedially; side of scutellum rugose (fig. 43); lateral carina of mesoscutum absent; propodeum without a medial carina and areola, its posterior part not separated from its antero-dorsal part; antepropodeal depression narrow; fringe of wings short; vein 1A + 2A of fore wing straight; vein 3-SR + SR1 of fore wing curved basally; 2nd tergite without a sharp lateral crease.

Distribution. — Cosmopolitan. Contains two genera: *Charmontia* gen. nov. from the Neotropical region, and *Charmon* Haliday from the other regions.

Genus **Charmontia** nov.

Etymology: fantasy name based on the genus name *Charmon*, to which it is closely related. Gender: feminine.

Type-species: *Charmontia inopina* spec. nov.

Diagnosis. — Length of body and of fore wing ca. 4 mm; apical segment of antenna without spine apically (fig. 897); length of 3rd segment of labial palp equal to length of 2nd segment (fig. 893); 1st discal cell of fore wing shortly petiolate (fig. 892); tarsal claws (except for the apical tooth) straight ventrally (fig. 894); anterior tentorial pits deep and large (fig. 898); scutellum weakly sculptured postero-medially (fig. 899); epicnemial area smooth, except for some rugae (fig. 890); episternal scrobe well-impressed and elliptical (fig. 890); pleural suture moderately crenulate and deep; length of 1st tergite ca. 2.8 times its apical width; length of hind femur ca. 7.4 times its apical width; ovipositor sheath much longer than fore wing; scutellum punctulate; propodeal spiracle round, small and situated submedially in propodeum; parastigma rather large (fig. 892); vein cu-a of hind

wing almost straight and medium-sized (fig. 892); hind coxa punctulate, but antero-dorsally rugulose and postero-dorsally striate (fig. 895).

Biology. — Unknown, but the long ovipositor suggests the same hosts as of the genus *Charmon*.

Charmontia inopina spec. nov. (figs. 889—900)

Holotype, ♀, length of body 4.4, and of fore wing 4.2 mm.

Head. — Antennal segments 41, length of 3rd segment equal to 4th segment, length of 3rd and 4th segments both 7.3 times their width, both penultimate segments each 2.5 times their width; length of maxillary palp 1.2 times height of head; dorsal length of eye 1.9 times temples; temples directly narrowed apically (fig. 900); POL : ⌀ ocellus : OOL = 8 : 3 : 8; frons convex, but behind antennal sockets flat and medially with a shallow suture; face punctulate, only finely striate medio-dorsally (fig. 898); clypeus rather convex, protruding apically (fig. 890), punctulate, and its margin straight medially; length of malar space 1.3 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.6 times its height; pronotal sides smooth, but medially crenulate and anteriorly with some rugae (fig. 890); anterior half of notauli (except posteriorly) distinctly impressed and crenulate (fig. 899); mesoscutal lobes smooth and distinctly convex; metanotum striate medially; surface of propodeum smooth, only medially reticulate-rugose.

Wings. — Fore wing: r : 3-SR + SR1 : 2-SR = 6 : 44 : 9; 1-SR + M straight; cu-a inclivous and longer than 1-CU1; 1-CU1 : 2-CU1 = 5 : 29. Hind wing: SC + R1 weakly curved; 1-M : cu-a = 1.1 : 1 (fig. 892).

Legs. — Length of femur, tibia and basitarsus of hind leg 7.4, 13.6, and 11.7 times their width, respectively; length of spurs of hind tibia 0.2 times hind basitarsus, subequal (fig. 895).

Metasoma. — Length of 1st tergite 2.8 times its apical width, its surface smooth, but medially somewhat rugulose; dorsal carinae of 1st tergite weakly developed in basal fifth and spiracles protruding (fig. 896); 2nd tergite smooth; length of ovipositor sheath 1.88 times fore wing.

Colour. — Blackish-brown; pterostigma, 2nd and 3rd tergites, and hind coxa, dark brown; rest of legs, palpi, tegulae, scapus basally, annellus and metasoma ventro-basally, more or less brownish-yellow; tibiae and coxae somewhat infuscated.

Holotype in CNC, Ottawa, ♀: "Pichinahuel, Cord. Nahuelbuta, Arauco, Chile, 10—20.1.1959, L. Peña", "New genus near *Charmon*, Det. W.R.M. Mason 76".

Genus **Charmon** Haliday

Haliday, 1833, Ent. Mag. 1: 262.
Čapek, 1969, Proc. ent. Soc. Wash. 71: 308 (as *Eubadizon*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 228, 230.

Čapek, 1970, Can. Ent. 102 : 850, 853, 868, 870, fig. 15.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 231.
Čapek, 1972, Ent. Problémy 10: 133, 136.
Čapek, 1973, Acta Inst. forest. zvol.: 264.
Van Achterberg, 1974b, Norsk ent. Tidsskr. 21: 110.
Mason, 1974, Proc. ent. Soc. Wash. 76: 237, 238.
Gauld & Huddleston, 1976, Entomologist's Gaz. 27: 43, 47, fig. 18.
Van Achterberg, 1976a, Tijdschr. Ent. 118: 250.
Van Achterberg, 1976b, id. 119: 37, fig. 100.
Tobias, 1976, Opr. Fauna SSSR 110: 136.

Type-species: *Charmon cruentatus* Haliday.

Synonyms: *Provancheria* Ashmead, 1900; *Cyclocormus* Cameron, 1911; *Eubadizon* auct. p.p.

Diagnosis. — Length of body 2.9—5.2, and of fore wing 3.3—5.9 mm; apical segment of antenna with an apical spine (fig. 53); 3rd segment of labial palp absent or shortly developed, much shorter than 2nd segment of labial palp (fig. 57); 1st discal cell of fore wing (sub)sessile (figs. 37, 63); tarsal claws convex ventrally (figs. 40, 52); anterior tentorial pits deep and medium-sized (fig. 27); scutellum smooth postero-medially; epicnemial area smooth; episternal scrobe narrow and linear; pleural suture indistinctly and finely crenulate, narrow and shallow (fig. 20); length of 1st tergite 1.3—1.7 times its apical width; length of hind femur 5.3—6.8 times its width; length of ovipositor sheath 0.60—1.55 times fore wing; scutellum smooth; propodeal spiracle round, small, and situated in front of middle of propodeum; parastigma large (fig. 63); vein cu-a of hind wing long and straight; hind coxa smooth or nearly so.

Biology. — Parasites of larvae of Lepidoptera with a hidden way of life.

Key to the species of the genus *Charmon*

1. Vein cu-a of fore wing much shorter than 1-CU1 (fig. 37), resulting in a rather transverse 1st subdiscal cell; basal half of vein M + CU1 of fore wing scarcely sclerotized; length of ovipositor sheath ca. 0.7 times fore wing; pterostigma dark brown medially; Australian region . . . *brevinervis* spec. nov. (p. 267)
— Vein cu-a of fore wing longer than 1-CU1, exceptionally subequal (figs. 26, 49, 75); M + CU1 largely sclerotized; 1st subdiscal cell less transverse (fig. 63); length of ovipositor sheath usually 0.82—1.55 times fore wing, if exceptionally shorter, then pterostigma yellowish medially; Holarctic, Afrotropical, and N. Oriental regions 2
2. Length of ovipositor sheath 0.60—0.74 (forma *brevicaudus* (Hellén)) or 0.82—1.20 (nominate form) times fore wing, exceptionally longer; pterostigma, apex of hind tibia, and hind tarsus yellowish, if intermediate, then middle of hind tibia and tarsus similarly coloured . . . . . *cruentatus* Haliday (p. 268)
— Length of ovipositor sheath 1.21—1.55 times fore wing, exceptionally shorter; pterostigma, apex of hind tibia, and/of hind tarsus infuscated, if intermediate, then middle of hind tibia lighter coloured than apices of hind tarsal segments . . . . *extensor* (Linnaeus) (p. 265)

Charmon extensor (Linnaeus)
(fig. 20—31)

Linnaeus, 1758, Syst. nat., Ed. 10: 564 (as *Ichneumon*).
Provancher, 1880, Naturaliste can. 12: 171 (*Eubadizon gracilis*). **Syn. nov.**
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 234, 237, 238.
Čapek, 1970, Can. Ent. 102: 853, fig. 15.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 231.
Capek, 1972, Ent. Problémy 10: 133, 136 (re-identification needed).
Mason, 1974, Proc. ent. Soc. Wash. 76: 237, 238.
Tobias, 1976, Opr. Fauna SSSR 110: 136 (re-identification needed).
Fitton, 1978, Biol. J. Linn. Soc. 10: 377.

Note. Because of the presence of two species in the Palaearctic region the existing literature (especially of Western European origin) deals, at least partly, with *Charmon cruentatus* Haliday.

Redescribed after a ♀ from Canada, Mobert; this ♀ was compared with the holotype of *C. gracilis* (Provancher) by Dr. W. R. M. Mason (Ottawa).

Head. — Antennal segments 44, its 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 5.7 and 5.0 times their width, respectively, both penultimate segments 1.7 and 1.8 times their width (fig. 25); length of maxillary palp 1.2 times height of head; dorsal length of eye 2.3 times temples; temples directly narrowed apicad (fig. 28); POL : ∅ ocellus : OOL = 5 : 5 : 7; frons flat; face almost smooth, but with some aciculation near the antennal sockets (fig. 27); clypeus rather convex, indistinctly punctulate, its margin straight medially; length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.5 times its height; pronotal side smooth, except for some indistinctly developed sculpture medially and posteriorly; notauli absent; mesoscutum smooth, except for some punctures (fig. 30); metanotum medially without well-developed carinae; surface of propodeum smooth, except for some microsculpture medio-basally (fig. 31).

Wings. — Fore wing: r : SR1 + 3-SR : 2-SR = 11 : 81 : 21; 1-SR + M sinuate; cu-a inclivous and longer than 1-CU1; 1-CU1 : 2-CU1 = 1 : 10. Hind wing: SC + R1 weakly curved; 1-M : cu-a = 0.8 : 1 (fig. 26).

Legs. — Femur, tibia and basitarsus of hind leg 5,9, 11.4, and 11.7 times their width, respectively; length of spurs of hind tibia 0.4 times the basitarsus, subequal (fig. 29).

Metasoma. — Length of 1st tergite 1.5 times its apical width, its surface finely longitudinally striate; dorsal carinae of 1st tergite absent and its spiracles indistinctly protruding (fig. 31); 2nd tergite smooth, but baso-laterally somewhat aciculate; length of ovipositor sheath 1.46 times fore wing.

Colour. — Dark reddish-brown; pedicellus, annellus, patch between eyes and ocelli, mandibles, prothorax, tegulae, metapleuron partly, metasoma ventrally and legs, yellowish, but hind tibia (except base), middle and hind tarsi, infuscated; 2nd and 3rd tergites more reddish; pterostigma rather dark brown.

Redescribed after ♀ from CNC: "Ex *Dioryctria reniculella*, Mobert, Ont.", "*Eubadizon gracile* Prov., CWT, Det. W. R. M. Mason, (19)60".

Specimens additionally examined: 215 ♀ and 97 ♂. From the Nearctic region: North West Territories (Yellowknife), Newfoundland (Blackhead), Nova Scotia (St. Peters; Grand River; Halifax), New Brunswick (Kedgwick; Summit Depot; Charlo; Green River (Lab.); Golden Ridge, Carlton Co.; Tobique; Upsalquitch), Quebec (Montigny; Park Reserve, Kam. Co., 950 ft; Harrington Lake, Gatineau Park; Lac Crescence; Duchesnay; Lac Mondor; Cascapedia River, Cape Rouge; Berthierville; New Richmond), Ontario (Rush Biv., 15 mi. SE Kenora; Cedar Lake; Chaplean; Bothwell; Arden; Hawk Lake; Wawa; White Falls; Thamesville; Vivian; Rossport; nr. Lake Erie; Richmond; Simcoe; Mobert; St. Davids, Normondale; Prescott; Ottawa, Holtyre; Stittsville; Chatterton; Dryden; Porcupine; Siouxhook; Vermilion Bay; Belleville; Twin Elm; One Sided Lake; South March), Alberta (Edmonton; Coleman; Eisenhower Jet, 4700 ft, Banff; Orion; Granada, Jasper), Saskatchewan (Saskatoon; Great Sand Hills, W. of Swift Current), British Columbia (Vancouver; Cowichan Lake; Victoria; Longford; Keremeos; Terrace), New Hampshire (6 mi S. Gorham, Notch Road), New York (Ithaca; Oneonta; Canadarago Lake), Massachusetts (Springfield), Michigan (Ann Arbor), Montana (Missoula), Wyoming (Yellowstone National Park, Cathedral Mt.), Oregon (Joseph), Colorado (Maybell; Nederland), North Carolina (Highlands, 3800 ft; Clingman's Dome), Virginia (Mountain Lake), Minnesota (Kawishiwi Field Lab.), Florida (Gainesville; Torreya St. Park), Texas (Navasota), Nevada (Lee Canyon, 38 mi. NW Las Vegas), California (Mono Co., Tom's Place; Oioville; San Francisco; Mill Valley, Marin Co.; Stanislaw Co., 5 mi. N. Turlock Lake; Pt. Reyes, Marin Co.; Mineral, 7400 ft; Tanayon Lake), Mexico (Dgo, 9000 ft, 10 mi. W. of El Salto; Chis., 7200 ft, S. Crist. Las Casas) (CNC, CAS, UCA, AMNH, RMNH, TC).

Specimens examined from the Palaearctic region: Finland (Korpo; Tråskriås; Jomala), Sweden (Ekshärad), USSR (Pavilnys; Ilmen, S. of Leningrad), Japan (Mt. Arakura, 1300 m; Nagano, 400 m; Shizuoka; Soranuma, Hokkaido; Mt. Gozaisho, Mie Honshu; Sarobeto, Hokkaido), Netherlands (Wijster; Drijber; Heerde; Herpen; Baarle-Nassau; Delft; Ede (Sijsselt)), West Germany (Steinbach am Wörthsee; Witzenhausen; Lippoldshausen), Czechoslovakia (Kuñrá), Austria (Gampenjoch, Südtirol, 1500 m; Bischofshofen; Flachgau, Zistelalm; Salm-Moos, Salzburg; Jüdenbergalm; Söllheim Autobahn), Italia (Bolzano, Sarntal, 1250 m; Campi, Riva s. Garda, 800 m; Castel Tesino, Trento, 1200—1500 m; Meran, 650 m) (RMNH, IZP, ZMH, ZSB, UZM, EI, HC, WHC).

Specimens examined from the Afrotropical region: Zaire (Lubumbashi (= Elizabethville)) (CNC, RMNH) and from the Oriental region (or South Palaearctic): India (Kashmir, Ladakh, Batalik, 2743 m) (DZD).

The holotype of *Ichneumon extensor* Linnaeus was examined by Mr. T. Huddleston (London), who kindly supplied his notes. This reveals that *Charmon gracilis* (Provancher) is actually a junior synonym of *extensor*. The holotype of *extensor* is in the Linnean Collection of the Linnean Society at London; the condition of this very dirty specimen is fairly reasonable. It bears two handwritten labels, one by Linnaeus ("34 *extensor*") and one by Smith ("*extensor* 935"). The pterostigma is very pale yellow but with a slightly infuscated border, the hind tibia

is infuscated apically, the hind tarsus is slightly infuscated, and the length of the ovipositor sheath is 1.22 times fore wing.

The holotype of *C. gracilis* (Provancher) (PC) was not available for examination, but the description of the colour by Provancher indicates its synonymy with *extensor*.

The variation of *C. extensor* (L.) is considerable: length of fore wing 3.5—5.3 mm; length of ovipositor sheath 1.21—1.55 times fore wing, exceptionally shorter; pterostigma and hind legs usually infuscated, but completely yellowish specimens occur (as in *cruentatus*). Especially the African specimens are yellowish; the occurrence of *extensor* and *cruentatus* in the Afrotropical region is in my opinion the result of a recent (Quarternary) invasion of both species from the Palaearctic region. The crossing of the Sahara was probably fairly easy during the last ice-age (De Jong, 1976). The only stable difference I could find was the yellowish colour, while colour is known to be a factor easily influenced by the temperature during the development of the larva and/or pupa. Also in the (Nearctic) Sonoran region *C. extensor* (L.) becomes more or less yellowish, probably also because of the influence of the temperature. In Europe *extensor* seems to be most common (compared with *cruentatus*) where a (sub)continental climate prevails, while *cruentatus* seems to be most common in a more or less Atlantic climate. Some of the specimens examined were taken at light.

Known hosts of examined specimens: *Acleris variana* (Fernald), *A. fuscana* (?), *A. minutacinderella* (?), *A. oxycoccana* Packard, *Argyrotaenia pinatubana* (Kearfott), *A. tabulana* (?), *Choristoneura fumiferana* (Clemens), *C. murinana* (Hübner), *Coleophora ulmifoliella* (?), *Dioryctria reniculella* (Grote), *Epinotia infuscana* (?), *E. nigricana* (?), *Eucordylea atrupictella* Dietz, *Eucosma radicana* (Walsingham), *Evagora* spec. (on Elm, Hemlock, and Black fir), *Hoffmannophila pseudospretella* Stainton, *Laspeyresia molesta* (Busck), *L.* (?) *arboreus* (?), *Operophthora bruceata* Hulst, *Recurvaria milleri* Busck, *R. starki* Freeman, *R. apicitripunctella* (Clemens) (on *Tsuga canadensis*), *R. canusella* Chambers, and *R. piceaella* Kearfott.

Charmon brevinervis spec. nov.
(figs. 32—44)

Holotype, ♀, length of body and of fore wing 4.4 mm.

Head. — Antennal segments 30, but apical segments missing, its 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 5.6 and 5.2 times their width, respectively (fig. 34); length of maxillary palp equal to height of head (fig. 32); dorsal length of eye 1.5 times temple; temple roundly narrowed apicad (fig. 44); POL : ∅ ocellus : OOL = 5 : 6 : 10; frons weakly concave; face indistinctly punctulate and with some rugulosity near antennal sockets (fig. 42); clypeus transversely convex, its surface almost smooth, and its apical margin almost straight medially, with long setae (fig. 42); length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; pronotal side smooth, except for some crenulae medio-anteriorly and posteriorly (fig. 32); notauli

completely impressed, but shallowly and indistinctly crenulate (fig. 43); mesoscutum smooth; metanotum with one medial carina; surface of propodeum smooth, but medially weakly rugulose.

Wings. — Fore wing: r : SR1 + 3-SR : 2-SR = 15 : 111 : 22; 1-SR + M weakly sinuate (fig. 37); cu-a short, almost straight, much shorter than 1-CU1 (fig. 35); 1-CU1 : 2-CU1 = 6 : 15; M + CU1 basally reduced (which is in other species complete, in fig. 75 of *Cyclocormus luteus* Cameron dotted because of damage). Hind wing: SC + R1 weakly curved; 1-M : cu-a = 0.4 : 1.

Legs. — Femur, tibia, and basitarsus of hind leg 5.3, 10.0, and 7.4 times their width, respectively; length of spurs of hind tibia 0.3 times the basitarsus, subequal (fig. 38).

Metasoma. — Length of 1st tergite 1.6 times its apical width, its surface rather coarsely longitudinally striate; dorsal carinae of 1st tergite developed in basal 0.4 and spiracles weakly protruding (fig. 41); 2nd tergite smooth; length of ovipositor sheath 0.68 times fore wing.

Colour. — Yellowish-brown; middle of pterostigma, wing veins in middle third of fore wing, propodeum, metapleuron, and 1st tergite, more or less dark brown; hind tarsus rather whitish-yellow.

Holotype in RMNH, Leiden, ♀: "Neth. Ind.-American New Guinea Exped., Rattan Camp, 1150 m, ii.1939, L. J. Toxopeus". For the location of this camp, see Toxopeus (1940).

Note. Besides the rather diffuse character-differences such as the somewhat longer malar space, the stouter mesosoma, the rather short vein 1-M of the hind wing, the rather transverse 1st subdiscal cell, and the long setae at the clypeal margin, this species is characterized by the reduction of the basal half of vein M + CU1 of fore wing, the short cu-a of fore wing and the short ovipositor sheath, combined with its coloration. It is surprising to see how close this species is to both other species of *Charmon*.

Charmon cruentatus Haliday
(figs. 45—79)

Haliday, 1833, Ent. Mag. 1: 262.
Nees von Esenbeck, 1834, Hym. Ichn. affin. Mon. 1: 236 (*Eubadizon pectoralis*). **Syn. nov.**
Cresson, 1872, Can. Ent. 4: 230 (*Eubadizon pleuralis*). **Syn. nov.**
Cameron, 1911, Ann. Transv. Mus. 2: 209 (*Cyclocormus luteus*). **Syn. nov.**
Hellen, 1958, Soc. Fauna Flora Fennica 4: 29 (*Eubadizon brevicauda*). **Syn. nov.**
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 228, 230, 235 (*Eubadizon extensor* auct.).
Van Achterberg, 1974b, Norsk. ent. Tidsskr. 21(1): 110.
Mason, 1974, Proc. ent. Soc. Wash. 76(3): 237, 238.
Gauld & Huddleston, 1976, Entomologist's Gaz. 27: 43, 47, fig. 18.
Van Achterberg, 1976b, Tijdschr. Ent. 119(3): fig. 100.

Redescribed from the neotype of *Eubadizon pectoralis* Nees, ♀, length of body 5.1, of fore wing 5.3 mm.

Head. — Antennal segments 44, its 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 4.8 and 4.2 times their width, respectively, both penultimate segments 1.8 and 2.2 times their width, respectively (fig. 53); length of maxillary palp 1.5 times height of head (fig. 45); dorsal length of eye 2.5 times temple; temple directly roundly narrowed apicad (fig. 50); POL : ∅ ocellus : OOL = 6 : 5 : 6; frons flat; face smooth, except for some striation near the antennal sockets (fig. 54); clypeus convex, punctulate, its apical margin straight medially and crenulate; length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.5 times its height; pronotal side anteriorly crenulate-striate and posteriorly crenulate-rugose, rest smooth (fig. 45); notauli impressed and narrowly crenulate (fig. 56); mesoscutum smooth, only medially punctulate; metanotum with one medial carina; surface of propodeum smooth, but medially punctate-rugose.

Wings. — Fore wing: r : SR1 + 3-SR : 2-SR = 9 : 53 : 13; 1-SR + M almost straight (fig. 49); cu-a long, inclivous, longer than 1-CU1; 1-CU1 : 2-CU1 = 2 : 38. Hind wing: SC + R1 slightly curved; 1-M : cu-a = 0.8 : 1.

Legs. — Femur, tibia, and basitarsus of hind leg 6.2, 12.0, and 10.8 times their width, respectively; length of spurs of hind tibia 0.3 times its basitarsus, subequal (fig. 51).

Metasoma. — Length of 1st tergite 1.7 times its apical width, its surface longitudinally striate (fig. 58); dorsal carinae of 1st tergite developed in front of the weakly protruding spiracles (fig. 58); 2nd tergite smooth, but subbasally indistinctly microsculptured; length of ovipositor sheath 1.05 times fore wing.

Colour. — Dark reddish-brown; palpi, pedicellus dorsally, annellus, patch between eyes and ocelli, tegulae, ptero- and parastigma, C + SC + R of fore wing, metasoma medio-ventrally and legs, yellowish; mandibles, mesopleuron, mesosternum and metapleuron, reddish; stemmaticum blackish.

Neotype in KBIN, Brussels, ♀: "Coll. Wesmael", "1879", "♂ *Eubadizon pectoralis* N. V. Es. ♀, det. C. Wesmael", "Type". Neotype of *pectoralis* herewith selected, and labelled accordingly. Because Wesmael is the first revisor and the Nees types are lost, a neotype is chosen to fix this name to one of the Palaearctic species. The lectotype of *Eubadizon pleuralis* (Cresson) (♀, ANSP) from Missouri is a genuine *cruentatus*, its ovipositor sheath is 1.06 times fore wing, while the legs and pterostigma are yellowish.

The holotype of *Eubadizon brevicauda* Hellén (WHC: "Terijoki, Hellén") from Finland is an aberrant form of *cruentatus* with very short ovipositor (figs. 60—71), its sheath is 0.60 times fore wing. Additional specimens of this form have been examined from Norway (1 ♀, Selva, nr. entrance of Trondheimsfjord, ca. 150 m), from the Netherlands (1 ♀, Wijster), and from Canada. A series reared from *Acleris variana* (Fernald) (Vancouver, British Columbia) showed that the short ovipositor occasionally occurs within a group of normal *cruentatus* specimens. The length of the ovipositor sheath of the form *brevicaudus* varies from 0.60—0.74 times fore wing. The cocoon of *cruentatus* is (as is that of *extensor*) a parchment-like brownish cocoon, covered by a fine filamentous tissue.

The holotype of *Charmon cruentatus* Haliday (♀, NMI) differs not from *Charmon*

extensor auct. nec L. The type is rather dirty, bears an old handwritten label "*cruentatus*", has a rather short ovipositor (sheath ca. 0.85 times fore wing), with legs and pterostigma yellowish.

The holotype of *Cyclocormus luteus* Cameron (♀, TMP, figs. 72—79) from S. Africa is a yellowish form of *cruentatus* as far as can be judged from the few Afrotropical specimens available for study. The body is mainly yellowish, with the apical antennal segments, mesopleuron, propodeum, 1st tergite, metasoma apically, pterostigma, and ovipositor sheath, more or less infuscated; stemmaticum black; length of ovipositor sheath 1.05 times fore wing and antennal segments 37.

Specimens examined: 260 ♀ and 102 ♂. From the Nearctic region: North West Territories (Judith Island, McKenzie River), British Columbia (Robson; Salmon River; Cultus Lake; Vancouver; Parksville); Ontario (St. Davids; Kimborn; Sioux Lookout; Orillia; Mer Bleue; Iron Bridge; Trenton); Quebec (Knowlton); North Carolina (Cherokee; Highlands, 3800 ft); Virginia (Mountain Lake; Roanoake); Utah (Longan); Illinois (Urbana); Kentucky (Mammoth Cave, Watl. Pk.); Florida (Gainesville; Torreya St. Park); California (Pozo, S.L.O. C.; Kernvale, Kern Co.; Eel River Rgr. Sta., Mendo Co., 1500 ft); Mexico (Baja California, 1 mi. E. Mission Santa Domingo) (CNC, UCA, RMNH).

Specimens examined from the Palaearctic region: Finland (Helsinki; Taivassalo; Vehkalahti; Lemland, Flaka); Denmark (no localities); Ireland (id.); England (Wyck Rissington, Glos.); Netherlands (Wijster; Assel (nr. Zwolle); Heerde; Putten; Otterlo; Naardermeer; Muiderberg; Overveen; Waarder; Asperen; Den Haag; Delft; Meijendel, Kijfhoek, Bierlap; Oostvoorne, dunes; Ouddorp; Oostkapelle; Valkenswaard; Schayk; Asselt), West Germany (Aachen; Thüringen; Bramwald; Grainbach, 800 m; Wiershausen; Gröbenzeller; Kottenforst (nr. Bonn); Rondorfer Tal, Siebengebirge; Unteres Ahrtal, Rheinprov.; Geisenheim, Rheingau); Austria (Salzburg, Flachgau, Veitlbruch; St. Peter, Ahrntal, Süd-Tirol, 1300 m; Obergurgl, Tirol, 1950 m); Italy (Campi, Riva s. Garda, 1500 m); France (Agoz, Haute Pyr.); Bulgaria (Rodopi, Velinograd) (RMNH, ZMH, HC, UZM, EI, ZMB, ZIL, CVR, CNC). From the Afrotropical region: Ivory Coast (Bingerville) and S. Africa (Pretoria) (MAC, TMP).

Variation: Antennal segments 37—44; length of fore wing 3.3—5.9, and of body 2.9—5.1 mm; length of 1st tergite 1.3—1.6 times fore wing; length of ovipositor sheath 0.60—1.20 times fore wing and exceptionally apex of hind tibia infuscated.

Known hosts of examined specimens: *Acleris variana* (Fernald), *Archips rosaceana* Harris, and *Grapholita molesta* (Busck).

Tribus HOMOLOBINI nov.

Diagnosis. — Occipital carina completely developed medio-dorsally; 3rd labial palp segment well-developed, although often small (fig. 82); tarsal claws with or without a subapical tooth or lamella; anterior tentorial pits deep and large; precoxal suture variable (figs. 105, 204, 616); middle lobe of mesoscutum more or less rounded anteriorly and without a protruding horizontal part (figs. 92, 119); vein 2A of hind wing absent; marginal cell of hind wing widened apicad; mandibles

twisted apically; vein 2-R1 of fore wing absent (fig. 85) or short (fig. 107); scutellum narrowly sculptured medio-posteriorly (figs. 119, 359); fringe of wings short; hind tibial spurs unequal and long, inner spur reaching middle of basitarsus (fig. 99); lateral carina of mesoscutum and vein r-m of fore wing present (fig. 18).

Distribution. — Cosmopolitan. Contains two genera: *Exasticolus* gen. nov. and *Homolobus* Foerster.

Genus **Exasticolus** nov.

Etymology: from "ἤξαστις" (Greek for "fringe") and "κωλον" (Greek for "leg"), because of the fringe-like comb apically at the inner side of the hind tibia. Gender: masculine.

Type-species: *Zele fuscicornis* Cameron.

Diagnosis. — Length of body 7.1—10.5, and of fore wing 6.6—10.1 mm; ventral margin of clypeus thin, separated from clypeus (fig. 91) and smooth; eyes bare, large, and distinctly emarginate (fig. 96); temples roundly narrowed apicad (fig. 86); metapleural flange large, lamelliform (fig. 80); precoxal suture mainly smooth (figs. 80, 105); antescutal depression medium-sized to rather large, deep (fig. 119); 3rd segment of labial palp small, length of 4th segment 6—12 times 3rd segment (figs. 82, 97, 117); ocelli large (fig. 91); epistomal suture present; pleural suture shallowly and narrowly crenulate (fig. 80); metapleuron mainly smooth (figs. 92, 105); episternal scrobe deep and small to medium-sized; notauli complete, and narrowly impressed (fig. 119); scutellar suture deep, with one longitudinal carina; scutellum smooth and convex; side of scutellum mainly smooth but posteriorly crenulate; propodeum at most with some irregular carinae, mainly smooth and its posterior part not separated from its antero-dorsal part; propodeal spiracle large, (sub)elliptical (fig. 80); antepropodeal depression medium-sized; 1-SR + M of fore wing curved distad (figs. 85, 94); 1st discal cell of fore wing subpetiolate; r of hind wing absent; SR of hind wing straight; SC + R1 of hind wing rather straight; 2-SC + R of hind wing short; 1 r-m of hind wing more (figs. 85, 94) or less (fig. 107) curved distad; cu-a of fore wing long and straight; parastigma large (fig. 85); 1A + 2A and SR1 of fore wing mainly straight; tarsi with a weakly-developed row of setae ventrally; inner aspect of hind tibia with a well-developed comb of bristles apically (figs. 98, 882); claws with a rather small, slender subapical tooth; length of hind femur 5.2—7.2 times its width; length of 1st tergite 2.2—3.0 times its apical width; 1st tergite concave medio-basally, convex medially and apically rather flat; 2nd tergite with a sharp crease laterally (fig. 80); metasoma of ♀ compressed apically; length of ovipositor sheath 0.06—0.10 times fore wing.

Biology. — The only host record (of *E. nigriceps* (Enderlein)) indicates a relation to the Lasiocampidae, which may suggests the function of the peculiar comb of the hind tibia. The comb may facilitate walking on the webs of the hosts during infestation. The Lasiocampidae are not known to be hosts of *Homolobus*, the sister-group of *Exasticolus*.

Distribution. — New World, contains three known species.

Key to the species of the genus *Exasticolus*

1. Middle coxa with an antero-ventral tooth (figs. 80, 89); 2nd tergite behind its middle rugulose-aciculate (fig. 90); hind basitarsus stout, its length 6.4—6.8 times its maximum width (fig. 733); length of maxillary palp of ♀ 1.2—1.3 times height of head . . . . *tuberculatus* spec. nov. (p. 272)
— Middle coxa without a tooth (fig. 128); 2nd tergite usually smooth, at most anterior half somewhat rugulose or pimply (figs. 104, 111); hind basitarsus slender, its length 9.1—10.4 times its width (fig. 99); length of maxillary palp of ♀ 1.5—2.1 times height of head 2
2. Length of malar space of ♀ 0.4—0.6 times basal width of mandible (fig. 96); face less coarsely rugose and yellowish (fig. 96); vertex with long rugae, reaching stemmaticum (fig. 95), exceptionally reduced; hind leg of ♀ yellowish, exceptionally partly dark brown . . *fuscicornis* (Cameron) (p. 273)
— Length of malar space of ♀ 0.2—0.3 times basal width of mandible (fig. 110); face coarsely rugose and blackish-brown (fig. 110); vertex almost smooth, at most with some short rugae which do not reach the stemmaticum (fig. 116); hind leg of ♀ partly dark brown . . . . *nigriceps* (Enderlein) (p. 275)

Exasticolus tuberculatus spec. nov.
(figs. 80—91, 731—733)

Holotype, ♀, length of body and of fore wing both 9.1 mm.

Head. — Antennal segments 47, 3rd segment 1.3 times 4th segment and with an indistinctly developed ridge, length of 3rd and 4th segments 3.9 and 3.1 times their width, respectively, both penultimate segments 2.7 and 2.3 times their width, respectively (fig. 83); length of maxillary palp 1.3 times height of head; dorsal length of eye 2.4 times temple; POL : ∅ ocellus : OOL = 4 : 6 : 4; frons smooth, rather flat; vertex dull coriaceous, and with some rugae anteriorly (fig. 86); face shiny coriaceous, weakly convex; clypeus convex, indistinctly punctate (fig. 91); malar space 0.6 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum smooth, but medio-anteriorly crenulate, posteriorly and ventrally narrowly rugose (fig. 80); epicnemial area and mesopleuron smooth; precoxal suture weakly impressed, only anteriorly with some rugae (fig. 80); notauli narrowly crenulate (fig. 731); mesoscutal lobes remotely and indistinctly punctulate; surface of propodeum submedially with some transverse rugae and anteriorly with a weak medial carina, remainder smooth.

Wings. — Fore wing: r : 3-SR : SR1 = 8 : 12 : 51; 1-CU1 : 2-CU1 = 2 : 26; 2-SR : 3-SR : r-m = 13 : 12 : 8; 2A only developed as a brownish stripe; area basally of 2A mainly bare as basal third of subbasal cell. Hind wing: 1r-m curved distad (fig. 81).

Legs. — Hind coxa punctulate, with some striae apico-dorsally (fig. 80); middle coxa with a well developed tooth antero-ventrally (fig. 89); claws indistinctly yellowish pectinate basally, except the inner claw (figs. 87, 88); femur, tibia, and basitarsus of hind leg 5.2, 9.5, and 6.8 times their width, respectively; length of

spurs of hind tibia 0.8 and 0.6 times basitarsus, somewhat curved, almost straight.

Metasoma. — Length of 1st tergite 2.2 times its apical width, its surface rather coarsely rugose behind the spiracles (fig. 80); dorsal carinae of 1st tergite absent, except for a basal remnant, and its spiracles protruding; anterior third of 2nd tergite almost smooth, somewhat coriaceous, its posterior two-thirds distinctly obliquely rugose-aciculate; 3rd tergite only pimply; length of ovipositor sheath 0.09 time fore wing.

Colour. — Brownish-yellow; stemmaticum and vertex around stemmaticum, blackish; mesoscutum somewhat more dark brown.

Holotype in TC, Ann Arbor: "Nova Teutonia, Braz., Santa Catarina, x.4.48, Fritz Plaumann". Paratype: 1 ♀, CNC, "Nova Teutonia, 27°11'S, 52°23'W, Brazil, 300—500 m, 25.ix.1948, Fritz Plaumann". Paratype: length of fore wing 9.3 mm, length of ovipositor sheath 0.10 times fore wing; length of maxillary palp 1.2 times length of head; length of hind basitarsus 6.4 times its width; 2nd tergite medially sculptured, but apical third mainly smooth.

Exasticolus fuscicornis (Cameron) comb. nov.
(figs. 92—104, 882—884)

Cameron, 1887, Biologia cent.-am., Hym. 1: 509, fig. 17—4 (as *Zele*).
Viereck, 1911, Proc. U.S. natn. Mus. 40: 478 (*Zele rosenbergi*). **Syn. nov.**
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 224—226.

Holotype, ♀, length of body 10.5, of fore wing 10.1 mm.

Head. — Antenna incomplete (but in 9 other ♀ specimens 42—48), remaining segments 13, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segment 3.8 and 3.1 times their width, respectively; length of maxillary palp 1.7 times height of head; dorsal length of eye 2.4 times temple; POL : ∅ ocellus : OOL = 4 : 10 : 4; frons concave, and almost smooth; vertex finely coriaceous, with some coarse rugae anteriorly, which reach the stemmaticum (fig. 95); face rather smooth and flat, near antennal sockets and laterally weakly transversely striate (fig. 96); clypeus convex, smooth, except for some punctures medially and some striae laterally; malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum smooth, except for some medial and apical rugae (fig. 92); epicnemial area smooth, except for some short rugae; mesopleuron superficially punctulate; precoxal suture absent, except for a shallow, smooth depression; notauli almost smooth anteriorly, medially superficially and finely crenulate (fig. 101); mesoscutal lobes smooth; surface of propodeum mainly smooth, except for an irregular transverse carina and some rugae between the dorsal and posterior surface (fig. 92).

Wings. — Fore wing: r : 3-SR : SR1 = 16 : 11 : 57; 1-CU1 : 2-CU1 = 3 : 21; 2-SR : 3-SR : r-m = 15 : 11 : 7; 2A and surroundings as in *tuberculatus*. Hind wing: 1r-m more or less curved distad (fig. 92).

Legs. — Hind coxa smooth, but dorso-apically striate (fig. 92); middle coxa without tubercle; inner hind claw equal to its outer claw (but in some specimens

slightly different), setose; femur, tibia, and basitarsus of hind leg 6.2, 9.9, and 10.0 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 3.0 times its apical width, its surface superficially and irregularly striate laterally (fig. 104); dorsal carinae of 1st tergite superficially developed up to middle of tergite; 2nd tergite smooth; length of ovipositor sheath 0.06 times fore wing.

Colour. — Brownish-yellow; antenna (as much as is present, but scapus, (except for a longitudinal dark brown stripe at the outer side and pedicellus, yellowish), stemmaticum and vertex, blackish-brown; hind basitarsus and spurs lighter than hind tibia.

Holotype in BM, London: "Type, H.T.", "B.M. Type, Hym. 3.c.862", "B.C.A. Hymen. I., *Zele fuscicornis*, Cam.", "Paso Antonio, 400 ft, Champion", "*Zele fuscicornis* Cam., Type, B.C.A., ii.4.09." (in Cameron's handwriting). The type-locality is situated in Guatemala.

Note. The males are very similar to the females in coloration, at most the metasoma apically and the mesonotum blackish. Sometimes the antennae of both sexes are rather yellowish brown. Total specimens examined: 88 ♀ and 168 ♂. From the Nearctic region: Ontario (Rondeau Prov. Pk.), Michigan (Ann Arbor), Maryland (Takooma Pk.), South Carolina (Wattacoo; Greenville), Georgia (Forsyth), Florida (Ft. Myers). From the Neotropical region: Mexico (Ver., Minatittan; Palomares, Oaxaco; Teapa, Tabasco), Panama (Fortuna, Chiriqui, 8°44′N, 82°15′W, 1050 m, at light), Costa Rica (Monteverde), Colombia (Dept. Magdalena, Pueblo Bello, 45 km W. Valledupar, Sierra Nevadade, S. Marta, 1100 m; Anchicaya Dam, 1200 (m?), 17 km E. Buenavanture; Colegio, Bolivar; Cundinamarca, Finca Bella Vista, nr. Sasaina), Ecuador (Coca, Napo R., Napo, 250 m; La Toma, W. Loja, 1500 m; Batapamba, 700 (m?); Sto. Domingo, 680 m, Pich. Prov.; Zambra), Surinam (Sipaliwini, at light), Peru (Loreto, Pucallpa; Tingo Maria, 750 m), Bolivia (20 km W. Laranjeiras, Dept. Beni; Rio Itenez, Pampa de Meio, Dept. Beni; mouth of Rio Baures; Rio Mamore, Dept. Beni, approx. 5 km NW mouth of Rio Grande; Rio Mamore, Dept. Santa Cruz, 2 km N. mouth of Rio Chapare; Dpto Santa Cruz, Estac. Experimental General Saavedra; Dpto Santa Cruz, Buena Vista; Alto Beni, Inicua R., 1100 m), Brazil (Nova Teutonia, Santa Catarina, 27°11′S, 52°33′W, 300—500 m; Sampaio, Teodora; Jatai, Goias; Bahia, Encruzihada, 960 m; Manaus; Pedra Azul, M. Ger., 600 m; Caruaru, 900 m; Serra do Caraca, S. Barbara, M. Ger., 1600 m; Jacareacanga, Pará; Linhares, E. Santo; Reprêsa Rio Grande, Guanabare; Itatiaja Nat. Pk., Rio de Jan.; Surumu, Roraine; Reserva Ducke, Manaus; Vilhena, Rond.), Paraguay (Escobar; Filadelfia, Fern. Col. Chaco, at light), and Argentina (Misiones, San Pedro; Salta, Tartagal; Corrientes, Las Narias, Camino Villa Virasoro; Misiones, Dos de Mayo; 11 km W. Las Cejas, Tucuman; La Plata; Horco Molle, nr. Tucuman) (TC, CNC, RMNH, IML, BM, USNM, TMA, MSU, AMNH, CAS).

Variation: Antennal segments 42—49; length of body 6.5—8.6, of fore wing 5.7—8.4 mm; length of ovipositor sheath 0.05—0.08 times fore wing; 1st tergite 2.2—2.9 times its apical width.

The holotype of *Zele rosenbergi* Viereck (♀, USNM, Washington: "Chanchamayo, E. Peru", "Collection Rosenberg", "Type No. 13797. U.S.N.M.", "*Zele rosenbergi* Vier. Type, ♀") is a typical *fuscicornis* specimen. The length of the malar space is 0.5 times basal width of mandible; claws absent; vein 1r-m of hind wing somewhat more curved than in holotype of *fuscicornis*.

Exasticolus nigriceps (Enderlein) comb. nov.
(figs. 105—111, 116—119)

Enderlein, (1918) 1920, Arch. Naturgesch. 84A(11): 217.
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 225.

Holotype, ♀, length of body 7.8, of fore wing 7.3 mm.

Head. — Antennal segments 46, 3rd segment 1.3 times 4th segment, length of 3rd and 4th segment 3.8 and 2.9 times their width, respectively, its penultimate segments 1.8 and 2.3 times their width; length of maxillary palp 1.7 times height of head; dorsal length of eye 2.9 times temple; POL : ∅ ocellus : OOL = 6 : 8 : 4; frons concave, smooth; vertex convex, largely smooth, slightly coriaceous (fig. 116); face rather flat and mainly, rather coarsely, transversely rugose (fig. 110); clypeus convex, smooth, except for some punctures; malar space 0.3 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum smooth, except for some medial and apical rugae (fig. 105); epicnemial area smooth, but anteriorly with some short rugae; mesopleuron superficially punctulate; precoxal suture absent, except for a smooth, weak depression (fig. 105); notauli finely and densely crenulate (fig. 119); mesoscutal lobes superficially punctulate; surface of propodeum mainly smooth, only submedially with an irregular transverse carina and some rugae (fig. 105).

Wings. — Fore wing: r : 3-SR : SR1 = 12 : 12 : 58; 1-CU1 : 2-CU1 = 2 : 25; 2-SR : 3-SR : r-m = 14 : 12 : 7; 2A present as a short remnant (fig. 107). Hind wing: 1r-m straight; short remnant of 2A present.

Legs. — Hind coxa smooth, except for some striae dorso-apically (fig. 108); middle coxa without tubercle; hind claws absent; femur, tibia, and basitarsus of hind leg 6.2, 9.9, and 10.0 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.9 times its apical width, its surface irregularly, longitudinally striate, with a smooth tubercle apically (fig. 111); dorsal carinae almost reaching apex of 1st tergite; 2nd tergite smooth, but superficially pimply; length of ovipositor sheath 0.06 times fore wing.

Colour. — Brownish-yellow; head (except for mandibles), 3rd-11th antennal segments and apical 0.7 of hind tibia, blackish-brown; scapus and pedicellus, partly reddish-brown; hind tarsus and palpi rather whitish-yellow.

Holotype in PAN, Warsaw: "Mexico, Chiapas, L. Conradt S., 15—11—07", "Type", "*Zele nigriceps* Enderl., ♀, Type, Dr. Enderlein, det. 1918", "Mus. Zool. Polonicum, Warsawa 12/45".

Number of additional specimens examined: 9 ♀ and 3 ♂. Variation: length of body 7.1—7.5, of fore wing 6.6—7.5 mm, length of 1st tergite 2.5—2.9 times its apical width; length of ovipositor sheath 0.07—0.08 times fore wing; antennal segments 44—48; length of maxillary palp 1.5—2.1 times height of head; dorsal carinae of 1st tergite sometimes absent or nearly so; length of malar space of ♀ 0.2—0.3 times basal width of mandible (in males 0.3—0.4 times).

Additional specimens examined from: Costa Rica (San Pedro de Montes de Oca), Ecuador (Loja; Coca & Napo Rivers; Playas de Montalro), Peru (nr. Marcapata, 30 m), Bolivia (Cochabamba, 17 km E. Villa Tunari), (British) Guyana (Upper Courantyne R., King Frederick, William IV Falls), and Brazil (Nova Teutonia, Santa Catarina; Villa Vera, 12°30'S, 50°31'W; Sinop, M. Grosso, 12°31'S, 55°37'W) (USNM, BM, IML, TC, RMNH). Only one specimen (from Costa Rica) was reared, the host being *Gloveria ballovi* Schaus, and belonging to the Lasiocampidae (Lepidoptera).

Genus **Homolobus** Foerster

Foerster, 1862, Verh. naturh. Ver. preuss. Rheinl. 19: 256.
Čapek, 1969, Proc. ent. Soc. Wash. 71: 308.
Watanabe, 1969, id. 71: 318—325, figs. 1—7.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 142.
Shenefelt, 1970, id. 5(2): 220—227.
Čapek, 1970, Can. Ent. 102: 851, 853, 868, 869.
Marsh, 1971, Ann. ent. Soc. Am. 56: 847.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 180, 230, 231.
Čapek, 1972, Ent. Problémy 10: 133, 136.
Čapek, 1973, Acta Inst. forest. zvol.: 262.
Mason, 1973, Proc. ent. Soc. Wash. 75: 213.
Kabašinskaite & Jakimavičius, 1973, Acta ent. Lituanica 2: 80, 86.
Papp, 1974, Fol. Ent. Hung. 27: 125—129, fig. 1.
Jakimavičius, 1974, Tr. AN. Lit. SSR B, 2(66): 97.
Čapek, 1975, Biológia 30(11): 819.
Gauld &Huddleston, 1976, Entomologist's Gaz. 27: 47.
Van Achterberg, 1976b, Tijdschr. Ent. 119: 37, 39, 44, 50, figs. 103, 104.
Jakimavičius, 1976, Tr. AN Lit. SSR B, 2(74): 90, 93, 95.
Tobias, 1976, Opr. Fauna SSSR 110: 31, 131, 133, fig. 39: 1—10.

Type-species: *Phylax discolor* Wesmael.

Synonyms: *Zele* auct. nec Curtis, 1832; *Phylax* Wesmael, 1835, nec Dahl, 1823; *Phylacter* Reinhard, 1863 (nom. nov. for *Phylax* Wesmael); *Apatia* Enderlein, (1918)1920. **Syn. nov.**

Diagnosis. — Length of body 4.4—14.6, of fore wing 4.6—15.9 mm; ventral margin of clypeus rather thin, not (fig. 132) or distinctly (fig. 360) separated from clypeus, smooth; eyes bare, large, weakly emarginate at inner sides (fig. 572) or almost immarginate (fig. 525); metapleural flange large, more (fig. 327) or less (fig. 416) lamelliform; precoxal suture variable; antescutal depression medium-sized to large, deep, with 1—3 longitudinal carinae (figs. 250, 331) or only crenulate (fig. 332), 3rd segment of labial palp medium-sized to small, length of 4th segment

1.6—7.0 times 3rd segment (figs. 164, 265); epistomal suture complete (fig. 311); ocelli medium-sized (fig. 213) to large (figs. 127, 275); pleural suture rather narrowly and shallowly crenulate (fig. 616); metapleuron smooth (fig. 263) to coarsely sculptured (fig. 527); episternal scrobe deep, medium-sized (figs. 633, 647); notauli complete, rather narrowly (fig. 473) to widely (fig. 413) impressed and crenulate; scutellum smooth or punctulate, and convex; side of scutellum crenulate (fig. 332), rugose (fig. 454) or striate (fig. 413); propodeum mainly smooth (fig. 128), coarsely areolate (fig. 400), or extensively rugose (fig. 414); antero-dorsal part of propodeum not (fig. 120) or distinctly (fig. 513) separated from its posterior part; propodeal spiracle medium-sized to large, elliptical or rather round (figs. 527, 541, 577); antepropodeal depression rather wide to medium-sized (figs. 250, 286, 661); 1-SR + M of fore wing straight (figs. 130, 368); 1st discal cell of fore wing sessile (figs. 196, 484) or subpetiolate (figs. 469, 455); r of hind wing present (fig. 122) or absent (fig. 147); SR of hind wing variable (figs. 184, 243, 368, 435); SC + R1 of hind wing straight (fig. 425) to curved (fig. 343); 2-SC + R of hind wing rather long (fig. 196), short and quadrate (figs. 266, 267) to vertical (figs. 506, 507); 1r-m of hind wing straight (fig. 122); cu-a of fore wing long, inclivous (fig. 130), straight (fig. 147) or somewhat curved basad (fig. 494); parastigma large (figs. 122, 484) to medium-sized (fig. 603); 1A + 2A and SR1 of fore wing straight (fig. 147) or 1A + 2A (figs. 368, 369) and SR1 (fig. 258) curved; tarsi without a ventral row of setae; inner aspect of apex of hind tibia without a comb of bristles; claws very variable, simple and without a subapical tooth (fig. 252), with subapical tooth (figs. 350, 351), with a ventral lamella (fig. 392), or with an enlarged lamella (figs. 393, 394); length of hind femur 4.7—8.1 times its width; length of 1st tergite 1.7—4.8 times its apical width; 1st tergite concave medio-basally and more or less convex medially (figs. 489, 615); 2nd tergite with a sharp lateral crease (fig. 401) or with a rounded fold (fig. 120); metasoma of ♀ compressed apically (fig. 231); length of ovipositor sheath 0.04—0.79 times fore wing.

Biology. — The numerous host records indicate that the species of *Homolobus* are parasites of caterpillars with more or less exposed way of life, mainly belonging to the families Noctuidae and Geometridae.

Distribution. — Cosmopolitan. Contains five subgenera: *Apatia* Enderlein, *Chartolobus* subgen. nov., *Homolobus* Foerster, *Phylacter* Reinhard, and *Oulophus* subgen. nov.

Subgenus **Apatia** Enderlein stat. nov.

Enderlein, (1918) 1920, Arch. Naturgesch. 84A(11): 219.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 142.

Type-species: *Apatia simillima* Enderlein (= *Bracon truncator* Say).

Diagnosis. — Length of body 4.4—9.0, of fore wing 4.6—8.7 mm; antennal segments 38—54; its 3rd—6th segments without a ridge at the inner side (figs. 879, 880); length of outer aspect of 4th segment of labial palp 1.6—5.5 times 3rd

segment; length of maxillary palp 1.0—1.4 times height of head; length of malar space 0.4—1.6 times basal width of mandible; temples roundly narrowed apicad (figs. 127, 163); length of hind femur 4.7—7.4 times its width; claws simple or nearly so, without subapical tooth or lamella (figs. 123, 152, 212); apices of hind tibial spurs of ♂ truncate and pigmented (figs. 112, 712) or sharp and hyaline (figs. 710, 713); inner hind claw of ♀ convex or straight basally, equal to its outer claw (figs. 202, 203, 881); 1A + 2A of fore wing straight; basal third of SR of hind wing mainly pigmented, not sclerotized (figs. 122, 130), straight (fig. 147) or weakly curved (fig. 161); SC + R1 of hind wing straight (fig. 146) or weakly curved (fig. 194); r of hind wing exceptionally present (fig. 122); length of 1st tergite 2.0—3.6 times its apical width; 2nd tergite smooth; length of ovipositor sheath 0.04—0.26 times fore wing; posterior part of propodeum not separated from antero-dorsal part (fig. 128).

Distribution. — With 11 out of 14 species (or 78.5%) occurring in the Afrotropical region, this is the main centre of speciation of this subgenus. Two species are extremely widely distributed: *truncator* occurs in the Holarctic, Neotropical and Oriental regions, while *ophioninus* is found in the Afrotropical, Palaearctic, and Australian regions.

Key to the species of the subgenus *Apatia*

1. Vein r of hind wing present, at least posteriorly (fig. 122); vein SR of hind wing weakly curved (fig. 122); lateral aspect of hind tibial spurs of ♂ sharp apically; Oriental . . . . *elagabalus* (Nixon) (p. 280)
— Vein r of hind wing absent (fig. 130); vein SR of hind wing, and tibial spurs of ♂ variable 2
2. First tergite black or dark brown, strongly contrasting with the, at least partly, whitish 2nd and 3rd tergites of metasoma; propodeum mainly smooth (fig. 128); or vein SR1 of fore wing straight (fig. 147) and precoxal suture mainly smooth (fig. 144) 3
— Basal tergites of metasoma brownish-yellow, if more or less dark brown, then 2nd tergite yellowish, dark brown, or blackish and less contrasting; propodeum sculptured posteriorly (fig. 158); vein SR1 of fore wing more or less curved towards R1 (figs. 161, 184), if straight, then precoxal suture extensively sculptured (fig. 204) 4
3. Malar space comparatively short (fig. 132), 0.4—0.6 times basal width of mandible; mesoscutal lobes smooth (fig. 136); veins SR1 of fore wing and SR of hind wing curved (fig. 130); claws without small prominence subapically (fig. 133); apices of hind tibial spurs of ♂ truncate; Australian . . . . *australiensis* (Nixon) (p. 282)
— Malar space comparatively long (fig. 151), 0.9—1.4 times basal width of mandible; mesoscutal lobes punctulate (fig. 157); veins SR1 of fore wing and SR of hind wing straight (figs. 146, 147); claws with a minute subapical prominence (figs. 152, 153); apices of hind tibial spurs of ♂ sharp; Afrotropical (Malagasy, Grande Comore) . . . . *albipalpis* (Granger) (p. 283)

4. Length of outer aspect of 4th segment of labial palp 3.0—5.0 times the small 3rd segment (figs. 200, 222, 235), if intermediate, then vein cu-a of fore wing antefurcal (fig. 206) and/or apical half of metasoma mainly dark brown or blackish 5
— Length of outer aspect of 4th segment of labial palp 1.6—2.8 times the medium-sized 3rd segment (figs. 246, 257, 265); vein cu-a of fore wing more or less postfurcal (figs. 266, 329); metasoma mainly yellowish apically 9
5. Tarsal claws of ♀ without any prominence (figs. 202, 203); vein SR1 of fore wing curved towards R1 (figs. 161, 196); vein SR of hind wing more or less sinuate (figs. 184, 196); Malagasy or non-Afrotropical 6
— Tarsal claws of ♀ with a tiny rounded subapical prominence (figs. 212, 225); veins SR1 of fore wing and SR of hind wing straight or nearly so (figs. 206, 234); African continent 7
6. Length of 4th segment of labial palp ca. 4—5.5 times the 3rd segment (fig. 185); upper part of mesopleuron and mesoscutum smooth (figs. 182, 186); veins r and 3-SR of fore wing of equal width (fig. 161); vein SR of hind wing moderately sinuate (fig. 184) or almost straight; Holarctic, Neotropical, Oriental . . . . . *truncator* (Say) (p. 285)
— Length of 4th segment of labial palp ca. 3.0—3.5 times 3rd segment (fig. 200); upper part of mesopleuron and mesoscutum punctulate or punctate (figs. 191, 201); vein r of fore wing wider than vein 3-SR (fig. 196); vein SR of hind wing rather strongly sinuate (figs. 194, 196); Malagasy *rufithorax* (Granger) (p. 289)
7. Length of malar space 1.2—1.6 times basal width of mandible (fig. 210); apical third of metasoma blackish or dark brown . . . . . *maculatus* spec. nov. (p. 291)
— Length of malar space 0.7—1.0 times basal width of mandible (figs. 229, 238), if intermediate, then apical third of metasoma yellowish 8
8. Vein r of fore wing longer than 3-SR (fig. 219); subapical prominence of claws of ♀ very small, scarcely visible at 80× (figs. 225, 226); head, antenna and hind leg mainly dark brown; palpi, tegulae, fore and middle coxae yellowish-white; C. Africa . . . . . *alternipes* spec. nov. (p. 292)
— Vein r of fore wing shorter than 3-SR (fig. 234), exceptionally of equal length; subapical prominence of claws of ♀ small, but at 80× easily visible (fig. 237); head, antenna, hind leg, palpi, tegulae, fore and middle coxae brownish-yellow; S. Africa . . . . . *priapus* (Nixon) (p. 293)
9. Vein SR of hind wing strongly sinuate (figs. 243, 258); marginal cell of hind wing distinctly narrowed medially in respect to its basal width (fig. 254); middle lobe of mesoscutum finely and densely punctate or punctulate (figs. 250, 262); scapus more or less dark brown; vein SC+R1 of hind wing comparatively short (figs. 254, 259) 10
— Vein SR of hind wing weakly sinuate (fig. 266); marginal cell of hind wing not or weakly constricted medially in respect to its basal width (fig. 290); middle lobe of mesoscutum smooth or weakly punctulate (fig. 300); scapus mainly yellowish; vein SC+R1 of hind wing somewhat longer (figs. 267, 307) 11
10. Marginal cell of hind wing constricted just after middle of the cell (fig. 243); length of ovipositor sheath 0.24—0.26 times fore wing, the exserted ovipositor

longer than 1.5 times length of 1st tergite (fig. 240); propodeum and 1st tergite irregularly sculptured (figs. 240, 253); C. Africa *lacteiceps* spec. nov. (p. 294)
— Marginal cell of hind wing constricted in front of middle of the cell (fig. 258); length of ovipositor sheath ca. 0.14 times fore wing, the exserted ovipositor slightly longer than 1st tergite (fig. 280); propodeum and 1st tergite evenly, finely and densely rugulose (figs. 142, 255); S. Africa .... *pulchricornis* (Nixon) (p. 296)
11. Vein 2-SC + R of hind wing transverse, longer than wide (fig. 290); length of hind femur 5.6—7.2 times its maximum width, usually comparatively slender (fig. 291), if intermediate, then upper condyli of mandibles rather far below lower level of eyes, or first tergite more slender, longer than 2.2 times its apical width (fig. 311); lateral aspect of hind tibial spurs of ♂ more or less truncate apically (figs. 296, 297) 12
— Vein 2-SC + R of hind wing vertical or quadrate (fig. 267); length of hind femur 4.6-5.8 times its maximum width, comparatively stout (fig. 269); upper condyli of mandibles comparatively close to lower level of eyes (fig. 270); 1st tergite stout (fig. 271), its length 1.7—2.2 times its apical width; lateral aspect of hind tibial spurs of ♂ sharp apically (figs. 272, 273) *huddlestoni* spec. nov. (p. 297)
12. Frontal aspect of head comparatively long, trapezoidal (figs. 311, 330); upper condyli of mandibles of ♀ distinctly below lower level of eyes (figs. 311, 330); length of malar space 0.8—1.1 times basal width of mandible, if exceptionally shorter, then claws setose basally (figs. 313, 314) 13
— Frontal aspect of head comparatively short, transverse (fig. 301); upper condyli of mandibles of ♀ close to lower level of eyes; length of malar space 0.3—0.7 times basal width of mandible; claws yellowish pectinate basally (fig. 294) .... *ophioninus* (Vachal) (p. 298)
13. Vein SC + R1 of hind wing somewhat curved and shorter (figs. 306, 307); marginal cell of hind wing usually less widened apicad, its apical width 1.9—2.2 times its maximum basal width (fig. 306); length of fore wing 3.5—7.1 mm; claws only setose or indistinctly pectinate basally (figs. 313, 314); ovipositor sheath in undistorted position rather wide apically (fig. 303) .... *truncatoides* spec. nov. (p. 300)
— Vein SC + R1 of hind wing almost straight and somewhat longer (figs. 329, 337); marginal cell of hind wing more widened apicad, its apical width 2.4—2.6 times its maximum basal width (fig. 329); length of fore wing 7.0—9.5 mm; claws distinctly pectinate basally (figs. 339, 340); ovipositor sheath somewhat more slender (fig. 335) .... *pallidistigmus* (Cameron) (p. 303)

Homolobus (Apatia) elagabalus (Nixon) comb. nov.
(figs. 120—127, 284, 332, 333)

Nixon, 1938, Bull. ent. Res. 29: 417, fig. 1f (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 223, 224.

Holotype, ♀, length of body 6.3, of fore wing 6.6 mm.

Head. — Antennal segments 33, but apical segments missing (44 according to original description), 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.2 and 3.0 times their width, respectively; length of 4th labial palp segment ca. 3 times 3rd segment (fig. 125); length of maxillary palp 1.2 times height of head; inner sides of eyes weakly emarginate (fig. 126); dorsal length of eye 3.7 times temple; POL : ∅ ocellus : OOL = 7 : 8 : 5; frons almost flat, smooth; vertex largely smooth, somewhat punctulate by insertions of the setae; face rather flat, finely rugose-punctate, only laterally more coriaceous (fig. 126); clypeus flattened, almost smooth, somewhat punctulate; apical margin of clypeus convex medially and not distinctly separated from clypeus; length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.2 times its height; side of pronotum almost smooth, except for some short crenulae medially and rugosity posteriorly (fig. 120); epicnemial area largely smooth, somewhat superficially rugose near subalar pit (fig. 120); precoxal suture scarcely impressed, superficially reticulate-punctate; rest of mesopleuron mainly smooth; metapleural flange wide, lamelliform, and rounded apically (fig. 120); metapleuron largely smooth, reticulate-carinate ventrally; notauli rather narrow (fig. 332); mesoscutal lobes smooth, except for some punctulation; surface of propodeum mainly smooth anteriorly, with a short irregular medial carina, medially and posteriorly transversely rugose (fig. 120).

Wings. — Fore wing: r : 3-SR : SR 1 = 10 : 13 : 60; SR1 curved anteriad; cu-a slightly inclivous and apically curved basad (fig. 122); 1-CU1 : 2-CU1 = 2 : 24; 2-SR : 3-SR : r-m = 11 : 13 : 7; 2A well developed (fig. 122); area basally of 2A remotely setose. Hind wing: r present, dividing the marginal cell into two subequal parts; SC + R1 and base of SR curved.

Legs. — Hind legs absent; fore and middle claws pectinate (figs. 123, 124); length of middle tibial spurs 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.7 times its apical width, its surface smooth (fig. 333); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.6 times fore wing.

Colour. — Brownish-yellow; antenna (but apically lighter) and stemmaticum, dark brown; pterostigma more transparent yellowish.

Holotype in BM, London: "Type", "B.M. Type, Hym., 3.c.678", "*Zele elagabalus* Nixon, Type, ♀, 1938", "1938/16 slide", "3836", "pres. by Imp. Inst. Ent. BM. 1939—92", "Parasite on *Selepa celtis*", "Dehra Dun, U.P., 26.xi.1935", "SNC Expt. No. 1294". Paratypes: 10 ♂, belonging to the reared series from which the holotype was selected. The tibial spurs are sharp and hyaline apically, number of antennal segments 41—42, anterior half of vein r of hind wing absent; vertex and temples punctulate; area basally of 2A of fore wing mainly bare, and precoxal suture somewhat more rugose-striate than in holotype.

Additional specimens examined (7 ♀) from Thailand (Bangkok, ex caterpillar feeding on *Sandoricum indicum*) and Philippines (Manila) (BM, TMA, RMNH). Variation: vertex and temple punctulate or finely punctate; length of malar space 0.4—0.5 times basal width of mandible; length of fore wing 5.6—7.5 mm; length of

ovipositor sheath 0.04—0.08 times fore wing. The ♀ from Manila is slightly aberrant: hind leg somewhat darkened, pterostigma and metasoma mainly dark brown, and left hind wing with a short vein m-cu (fig. 284).

Homolobus (Apatia) australiensis (Nixon) comb. nov. (figs. 128—137)

Nixon, 1938, Bull. ent. Res. 29: 419 (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 221.

Holotype, ♀, length of body 6.5, of fore wing 6.7 mm.

Head. — Antennal segments 37, but apical segments missing (according to original description 46), 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.6 and 3.2 times their width, respectively; length of 4th labial palp segment 2.9 times 3rd segment (fig. 131); length of maxillary palp 1.2 times height of head; inner sides of eyes weakly emarginate (fig. 132); dorsal length of eye 2.3 times temple; POL : ∅ ocellus : OOL = 6 : 7 : 6; frons rather flat, largely smooth, with some striae near anterior ocellus and punctulate laterally (fig. 134); vertex mainly smooth, except for some punctulation; face and clypeus flattened, punctulate (fig. 132); apical margin of clypeus weakly convex and not distinctly separated from clypeus; length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum smooth, but with some crenulae medially and apically (fig. 128); epicnemial area smooth, but somewhat punctulate anteriorly; precoxal suture scarcely impressed, rugose-punctate medially and indistinctly punctate anteriorly and posteriorly (fig. 128); rest of mesopleuron smooth; metapleural flange large, lamelliform and truncate apically (fig. 128); metapleuron smooth, except for some carinae ventrally; notauli medium-sized, strongly crenulate (fig. 136); mesoscutal lobes smooth; surface of propodeum smooth, except for some indistinctly developed rugosity posteriorly, without carinae (fig. 128).

Wings. — Fore wing: r : 3-SR : SR1 = 10 : 17 : 74; SR1 curved anteriad; cu-a inclivous and apically curved basad (fig. 130); 1-CU1 : 2-CU1 = 1 : 10; 2-SR : 3-SR : r-m = ca. 14 : 17 : 10; 2A well developed (fig. 130); area basally of 2A remotely setose. Hind wing: r absent; SC + R1 and SR weakly curved.

Legs. — Hind coxa smooth; claws simple, long setose and with some bristly setae basally (fig. 133); length of femur, tibia, and basitarsus of hind leg 7.4, 11.5, and 10.8 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus; outer side of hind tibia rather spiny (fig. 137).

Metasoma. — Length of 1st tergite 3.0 times its apical width, its surface smooth, except for some punctulation; dorsal carinae of 1st tergite absent, except for a vague remnant basally (fig. 135); length of ovipositor sheath 0.07 times fore wing.

Colour. — Brownish-yellow; antenna (except main part of scapus and pedicellus), stemmaticum, hind leg and metasoma, blackish-brown, but 2nd tergite laterally, 3rd tergite laterally and apically, metasoma baso-ventrally, apex of hypopygium and ovipositor sheath, whitish-yellow; pterostigma, C + SC + R and R1 of fore wing, brown; wing membrane weakly infuscated.

Holotype in BM, London: "Type", "B.M., Type, Hym., 3.c.680". "*Zele australiensis* Nixon, holotype, ♀", "MacKay, Queensland, 1909—45", "MacKay, 2.94", "912". Total number of additional specimens examined: 27 ♀ and 19 ♂, all from Australia. Queensland: Bluff Range, nr. Biggenden; Mt. Crosby; Mt. Cootha; Mt. Tamborine; Brisbane. New South Wales: Woodford; Willowtree; 1 mi. W. Wombeyan Cayes; 2 mi. N. Boonoo Boonoo, nr. Tentifield; Mt. Brown. Western Australia: Drummonds Cove, nr. Geraldton; Jacup; 19 mi. ENE. Perth. Northern Territories: McArthur River, 14 km SW. Cape Crawford. Australian Capital Territory: Blundell's F.C.T.; Handmarsh Falls, at light; Canberra. Southern Australia: Cape Jervis. Victoria: Nowa Nowa; Mt. Hotham. Tasmania: Mt. Barrow; Coles Bay; Togari; Port Davey; Port Arthur (TC, BM, CNC, RMNH, CSIRO).

Variation: Length of ovipositor sheath 0.06—0.07 times fore wing; length of malar space 0.4—0.6 times basal width of mandible; length of fore wing 6.3—6.7 mm; length of 4th segment of labial palp 2.3—2.6 times 3rd segment; apices of hind tibial spurs of ♂ truncate and pigmented apically; middle of propodeum finely rugose or rather coarsely sculptured; wing membrane rather hyaline to dark brown; sometimes middle legs, propodeum and metanotum, blackish; 2nd and 3rd tergites often mainly whitish-yellow, except for a narrow blackish longitudinal stripe at middle of 2nd tergite, but exceptionally absent; head colour varies from mainly brownish-yellow to dark brown or black. The (in the genus *Homolobus*) unusual blackish/whitish colour markings may indicate that *australiensis* belongs to a mimetic complex of species. The same colour pattern occurs in *Homolobus* also in species from Malagasy, which are not closely related to *australiensis*.

Homolobus (Apatia) albipalpis (Granger) comb. nov.
(figs. 144—157)

Granger, 1949, Mém. Inst. scient. Madagascar 2A: 378, fig. 384 (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 221.

Redescribed after a ♀ from Ranomafana (Malagasy), length of body 4.4, of fore wing 4.6 mm.

Head. — Antennal segments 40, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 3.7 and 3.1 times their width, respectively, length of both penultimate segments 1.6 and 1.8 times their width; length of 4th segment of labial palp 4.0 times 3rd segment (fig. 154); length of maxillary palp 4.0 times height of head; inner sides of eyes weakly emarginate (fig. 151); dorsal length of eye 2.0 times temple; POL : ⌀ ocellus : OOL = 9 : 9 : 12; frons rather flat, with some striae and punctulate laterally; vertex punctulate, rather flat; face weakly convex and punctate; clypeus convex, remotely punctate; apical margin of clypeus rather straight medially and not distinctly separated from clypeus (fig. 151); length of malar space 1.1 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum almost smooth dorsally and ventrally, medio-anteriorly crenulate and posteriorly

rugose (fig. 144); epicnemial area mainly smooth; precoxal suture absent, except for a shallow depression, weakly punctulate, as rest of mesopleuron; metapleural flange large, stout, rounded apically, bordered by a narrow carina; metapleuron smooth, but with some rugae ventrally; notauli deep and widely crenulate posteriorly, narrowed anteriad (fig. 157); mesoscutal lobes punctulate; anterior surface of propodeum mainly smooth, but posterior half weakly reticulate-rugose (fig. 144).

Wings. — Fore wing: r : 3-SR : SR1 = 11 : 12 : 78; SR1 straight; cu-a almost straight (fig. 147); 1-CU1 : 2-CU1 = 3 : 31; 2-SR : 3-SR : r-m = 17 : 12 : 11; 2A shortly developed (fig. 148); area basally of 2A mainly bare. Hind wing: r absent; SR straight; SC + R1 weakly curved (fig. 146).

Legs. — Hind coxa finely punctate and dorso-apically shortly striate; tarsal claws with a scarcely visible subapical prominence (figs. 152, 153), setose basally; length of femur, tibia, and basitarsus of hind leg 5.6, 9.8, and 7.2 times their width, respectively; length of spurs of hind tibia 0.7 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.3 times its apical width, somewhat narrowed apically, its surface smooth (fig. 156); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.11 times fore wing.

Colour. — Yellowish-brown; stemmaticum, metasoma (except for the whitish 2nd and 3rd segments and 1st sternite), black; 2nd and 3rd tergites yellowish-white, but apical margin of 3rd tergite narrowly blackish; 1st-3rd segments of labial palp, 1st and 2nd segments of maxillary palp, dark brown; 4th segment of labial palp and 3rd-6th segments of maxillary palp, whitish-yellow.

Redescribed after ♀ from Malagasy, Ranomafana, X.1938 (MNHN, Paris). Holotype in MNHN, Paris, ♂: "Madagascar, Ankaratra, Alt. 1800 m", "Muséum Paris, II.38, A. Seyrig", "Type", "*Zele albipalpis* Gr., B. Sigwalt". Antennal segments 47; length of malar space 1.4 times basal width of mandible; length of fore wing and of body both 6.4 mm; length of maxillary palp 1.5 times height of head; pronotum and propodeum somewhat more sculptured than in figured specimen; length of 1st tergite 2.7 times its apical width; apices of spurs of hind tibia sharp and hyaline; whole 3rd tergite whitish; 2nd and 3rd segments of labial palp whitish; head, all coxae, fore and middle tarsi, propleuron and pronotum ventrally, infuscated to dark brown; hind tarsus yellowish.

Additional specimens examined from Malagasy and Grande Comore, 8 ♀ and 1 ♂ (Malagasy: Mandraka; Manjakatampo; Ankaratra-Antsasbatana, sous forêt, 0—5 h, 1970 m; Sakavondro, 40 m, Fort Dauphin; Andranotobaka, 1400 m, Ambatolampy. Grande Comore: Convalescence, 1700 m; Nioumbadjoe, 505 m). Variation: Length of fore wing 4.1—7.2, of body 3.6—6.8 mm; length of ovipositor sheath 0.11—0.13 times fore wing; length of malar space 0.9—1.4 times basal width of mandible. Length of 4th segment of labial palp 4.0—5.0 times 3rd segment; length of 1st tergite 2.1—2.8 times its apical width; antennal segments 38—47; colour of 3rd tergite completely white to mainly black, palpi mainly white, yellowish, or wholly dark brown, except the 6th segment of maxillary palp (MNHN, RMNH, MAC).

Note. In addition I have examined an aberrant series of 5 melanistic ♀

specimens from Andranotobaka (Malagasy, 1400 m, Ambatolampy, MNHN, RMNH). The 2nd and 3rd tergites are mainly blackish, at most are the margins more or less whitish-yellow, the hind leg (except for the coxa and trochanter) and palpi are mainly dark brown, and length of malar space 1.0—1.2 times basal width of mandible. In the key they may run to *maculatus*, but *maculatus* differs by the colour, the finely sculptured propodeum, and the longer malar space.

This species may be confused with the other almost similarly coloured species from Malagasy, viz., *cingulatus* and *inopinus*. But the females of the latter two species have an antennal ridge, the inner hind claw concave basally and the precoxal suture more extensively sculptured. The males are less easy to separate, but the posteriorly scarcely sculptured precoxal suture, the mainly white 3rd tergite and usually whitish apical segments of the palpi of *albipalpis* may be sufficient to separate them from *cingulatus* and *inopinus*.

Homolobus (Apatia) truncator (Say) comb. nov.
(figs. 112—115, 158—168, 174—176, 178—190, 711, 879—881)

Say, 1828, Contrib. Maclur. Lyc. Philad. 2: 381 (as *Bracon*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 227.
Wesmael, 1835, Nouv. Mém. Acad. Brux. 9: 161 (*Phylax calcarator*). **Syn. nov.**
Cresson, 1872, Trans. Am. ent. Soc. 4: 178 (*Phylax melleus*). **Syn. nov.**
Viereck, 1905, Trans. Kans. Acad. Sci. 19: 279 (*Zele crassicalcaratus*). **Syn. nov.**
Bengtsson, 1918, Acta Univ. Lund. (2)14(32): 42, fig. 18 (*Phylacter fuscitarsis*), **Syn. nov.**
Enderlein, (1918) 1920, Arch. Naturgesch. 84A: 218, fig. 10 (*Zele unicolor*). **Syn. nov.**
Enderlein, (1918) 1920, id. 84A: 219 (*Apatia simillima*). **Syn. nov.**
Nixon, 1938, Bull. ent. Res. 29: 420, fig. 1d (*Zele chlorophthalma* (nec Spinola, 1808!). **Syn. nov.**
Papp, 1971, Acta zool. Acad. Sc. hung. 17: 53.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 230.
Čapek, 1975, Biológia 30: 819.
Tobias, 1976, Opr. Fauna SSSR 110: 131, fig. 39: 2—4.

Neotype, ♀, length of body 6.8, of fore wing 6.3 mm.

Head. — Antennal segments 50, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.2 and 2.8 times their width, respectively, penultimate segments 1.9 and 2.3 times their width (fig. 162); length of 4th segment of labial palp ca. 4 times 3rd segment (fig. 164); length of maxillary palp 1.3 times height of head; eyes weakly emarginate at the inner sides (fig. 165); dorsal length of eye 1.6 times temple; POL : ∅ ocellus : OOL = 12 : 13 : 16; frons almost flat, with some superficial striae near antennal sockets (fig. 163); vertex smooth, but with some microstriae near ocelli; face rather flat, superficially rugose below the antennal sockets and punctulate ventrally; clypeus rather flat, punctulate; apical margin of clypeus scarcely separated from clypeus, slightly convex medially (fig. 165); length of malar space 0.5 times basal width of mandible; mandible rather weakly twisted apically (fig. 165).

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum largely smooth, medially widely and posteriorly more narrowly crenulate (fig. 158); epicnemial area rugose-punctate; precoxal suture rather coarsely rugose-punctate (fig. 158); rest of mesopleuron smooth; metapleural flange rather large,

lamelliform, truncate apically and wide; metapleuron largely smooth, only rugose ventrally; notauli deep, rather widely crenulate (fig. 168); mesoscutal lobes smooth; surface of propodeum narrowly smooth anteriorly and with a short medial irregular carina, medially and posteriorly reticulate-rugose (fig. 158).

Wings. — Fore wing: r : 3-SR : SR1 = 8 : 11 : 52; SR1 somewhat curved anteriad (fig. 161); cu-a slightly inclivous and curved; 1-CU1 : 2-CU 1 = 2 : 21; 2-SR : 3-SR : r-m = 10 : 11 : 7; 2A mainly present as an only pigmented brownish stripe (fig. 161); area basally of 2A mainly bare. Hind wing: r absent; SR and SC + R1 weakly curved (fig. 161).

Legs. — Hind coxa smooth, except for some microsculpture (fig. 167); tarsal claws simple, setose basally, rather bristly (fig. 160); length of femur, tibia, and basitarsus of hind leg 6.0, 9.5, and 8.5 times their width, respectively; length of spurs of hind tibia 0.7 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 3.2 times its apical width, its surface rather superficially and irregularly punctate-rugose (fig. 166); dorsal carinae of 1st tergite weakly developed in basal half of tergite; length of ovipositor sheath 0.07 times fore wing.

Colour. — Brownish-yellow; stemmaticum black; flagellum of antenna dark brown; palpi and ovipositor sheath rather whitish-yellow.

Neotype in RMNH, Leiden: "U.S.A., Mich., Ann Arbor, 25—30.VIII.1976, Malaise-traps, C. van Achterberg".

Note. Males are very similar to the females, but the apices of the spurs of the hind tibia are truncate and pigmented apically (fig. 112). Known hosts of examined specimens belong to the Noctuidae (*Amathes smithii* (Snellen), *Porosagrotis orthogonia* (Morrison), and *P. tristicula* (Morrison)) and to the Geometridae (*Hypagyrtis piniata* (Packard), *Lycia zonaria* (Denis & Schiff.), and *Semiothisa bitactata* (Walker)).

Total number of specimens examined: 324 ♀ and 223 ♂. From the following localities in the New World: British Columbia (3 mi. E. Lytton, 800 ft), New Brunswick (Charlotte Co.), Nova Scotia (Mount Uniacke), Quebec (Kazubazua; Queen's Park, Aylmer; Wright; Kirks Ferry, light trap; Knigsmerg), Ontario (Chaffeys Locks; Bothwell; Ottawa; Chalk River; Rondeau Park; Leamington; Stratbury; Aylmer West, Malaise-trap), Saskatchewan (Beverley; 2 mi. Scout Lake, 2600 ft; Sceptoe), Alberta (Brooks, Lethbridge; Rotlaw; Duchess), Manitoba (2 mi. W. Stockton), Rhode Island (Westerly), New York (Ithaca, 6 Mile Creek; Oneonta; Otsego L.; Troy; Poughkeepsie; Farmingdale; Elmire), New Jersey (Moorestown), Michigan (George Res., Livingston Co.; Oakland Co.; Ann Arbor, Malaise-trap; Crystal Falls, Iron Co.), Connecticut (Canterbury), Kansas (Lawrence; Elwood; Douglas Co.), Kentucky (Golden Pond, Malaise-trap), Louisiana (Rapides Parish; Shreveport; Bayon Chicot, Evangeline Co.), Montana (Big Spring State Park; Williamsville, Malaise-trap), North Carolina (Black Mts.; Murfreesboro; Faison; Raleigh; Wake Co.), South Carolina (Columbia; Greenville; McClellanville; Table Rock; Wattacoo, Pickers Co.), Indiana (Posey Co., Murphy's Park, New Harmony), Arkansas (Hope), Maryland (Plummers Island; Prince Georges Co., Beltsville; Takoma Pk.; Patuxent Ref., Bowie;

Laurel), Virginia (Galax; Charlottesville), Missouri (Cp. Shelby, nr Hattiesburg; Mamon Co., Monroe City), Georgia (Forsyth; Waycross), Illinois (Wheaton, Dupage Co.); Nebraska (Valentine Refuge; Thomas Co., Neb. Nat. Forest, 2.5 mi. W. Halsey; 5 mi. NW. Harrison, 4400 ft), Colorado (Boulder; 6 mi. SE. Maybell, 6200 ft), Minnesota (Moorhead, Clay Co.; Big Fork), Wyoming (Douglass; Sweetwater Co., 11.5 mi. S. Eden; 6 mi. N. Sage), Tennessee (Knoxville), Oregon (Jackson Co., Mt. Ashland, 6500—7000 ft), Idaho (Butte Co., Crater of Moon), Florida (Subtrop. Exp. Sta., Homestead; Miami; Gainesville, Miachua Co., black light; Lake Placid; De Funiah Spring; Highlands Co., Archbold Biol. Stat.; Tall Timbers; Dunedin), California (Murray Kings Co., U.V. light trap; Walliston; Potrero, S.D. Co.; Julian; Cedar Pass, 6000 ft, Warner Mts., Modoc Co.; Cuyamaca; Andreas Cyn., Palm Springs; Orinda Village, Contra Costa Co., San Pablo Ridge, below Eureka Peak, 1000—1200 ft, oak-chaparral zone; 6 mi. E. Coalinga, Fresmo Co., U.V. light trap; Boyd Desert Res. Center, 4 mi. S. Palm Desert, Rw. Co.; 9 mi. W. Lone Pine, Inyo Co.; Kern Co.; San Ignacio L.; Catarina L.; Riverside Co., Agua Caliente, Ind. Res., Palm Canyon), Nevada (Austin Summit, Lander Co., at black & white light; Washoe Co., 21 mi. SE. Eagleville (Cal.); Golconda), New Mexico (Hatch, Raton, 6660 ft, Colfax Co.), Texas (San Antonio, at light; Brownwood; Kerville; Ft. Davis, Limpia Cyn., 5000 ft; Big Band N. P., Panther Junction, 3500—4000 ft), Arizona (Baboquivari Mts.; SW. Research Sta. of AMNH, Cave Creek Cyn., 5400 ft, Chiricahua Mts., Cochise Co.; Indian Wash nr Martinez Lake, Yuma Co., at light; Tuczon; Pima Co., Organ Pipe Cactus Nat. Mon., Williams Springs, flight trap; nr Roosevelt L.; Cochise Co., Pinery Cyn., Chiricahua Mts., Portal; Ajo; Huachuca Mts., Sierra Vista; 3 mi. W. Eager, 7100 ft, Pinon-Juniper zone; Ramsey Cyn., 6000 ft, 15 mi. S. Sierra Vista, Huachuca Mts.), Mexico (Vera Cruz, Fortin; Baja California, Norte, Diablito Cyn., East face Sierra San Pedro Martir, at light; id., Ensenada, at light; id., 7 mi. W. Las Arrastras de Arriola; id., Bajada, 8 mi. E. of Ojos Negros, at light; 20 mi. E. Guasave, Sin.; Santa Clara Cyn., 5 mi. W. Parrita, Chih.; 2 mi. W. Tlaxcala, Tlaxcala, swept from alfalfa; Chiap., Suchiapa; Oax., 4 mi. SE. Oaxaca; 20 mi. NNW. Obregon, Son., at light; Citlaltepetl, V. Cruz, 3000 ft; 10 mi. W. Vera Cruz; Sonora, Bahia San Carlos; id., 83 mi. W. Sonoyta; Sinaloa, 25 mi. E. of Los Mochis; Linares, N.L.; Teotihuacan, Pyr. Mex.; 15 km E. Sombrerete, Zac., at light; Fortin de las Flores, 3400 ft, Malaise-trap; Boquillas del Carmen, Coah., 1850 ft; 30 mi. SW. Tehuacan, Pue, 6800 ft; Chipinque Mesa, 5400 ft, nr. Monterrey, N.L.; nr. Jame, 7500 ft, 31 mi. SE. Saltillo, Coah.; 5 mi. S. Monterrey, N.L.; Dgo, 3 mi. E. El Salto, 8500 ft; Sin., 20 mi. E. Concordia, 3000 ft; Dgo, 24 mi. W. La Cuidad, 7000 ft; Dgo, 6 mi. S. Durango, 6100 ft; Oax., El Paredon; Lake Catemaco, Ver.; Dgo, 10 mi. W. El Salto, 9000 ft; Atlacomulco, 8500 ft; Orizaba, Ver.), El Salvador (Quezaltepeque, 500 m), Panama (Cerro Punta, Chiriqui, 6500 ft), Costa Rica (Monte Verde), Guatemala (Sacapulas, 4500 ft), Cuba (Soledad, Cienfuegos; Cuabitas, Stgo. de Cuba, Ote), and Venezuela (Cagua Edo, Aragua, at light) (RMNH, CAS, UCA, TC, USNM, AMNH, CNC, PAC, PAN, MSU, ANSP).

From the Palaearctic and Oriental regions: Finland (Dickursby), Sweden (Lund), Denmark (Emelsbu, Søderjylland; Sondbg; Charlottenlund), East

Germany (Thüringen; Berlin), West Germany (Rheingau, Gusenheim; Föhr; Moosburg; Würzburg; Garmisch, Ober-Bayern, Ettuler berg, ca. 700 m; id., Murnau, 700 m), Netherlands (Amsterdam; Kasteel Neercanne, St. Pietersberg, at light), Belgium (nr. Charleroy), Czechoslovakia (Karlătejn; Pavlovake Kopce, Bolni Věstonice), Poland (Gdansk), USSR (Moscow; Karagand, S. Tsj.-Ąrka, pojma, Taldi-Manaka; Karagandinsk obl., 20 km W. Karkaralins; Sveuciouiliym, Lit. SSR), Switzerland (Wallis), Austria (Süd-Tirol, San Martino di Castroza, 1444 m; Sansal Gebirge, 300—500 m, Styria; Nord-Tirol, Oberinntal, Kauns nr. Prutz, 1000—1400 m), France (Cestas, Gironde; Vallon Pont d'Arc, Ardèche; Grignon; Crimaud, Var), Jugoslavia (Hercegovina, Buna), Bulgaria (Mandrisa, Rodopi; Karamansi, Rodopi), Hungary (Crepel; Baranya-Megya, Nagyharsany), Romania (Cibinsgeb., Transsylv. Alp.; Dannehl, id.), Spain (15 km NW. Tarifa; Albaracia), Cyprus (Yermosoyia River; Skouili, Sapho Dist., nr. Limasol), Tunesia (Nefta), Turkey (Priene, Asia Minor), S. India (Shevaroy Hills, 4500 ft, Yercaud), Philippines (Baguio, Benguet), and Taiwan (Taihorinsho) (RMNH, MNHN, TC, CNC, WHC, UZM, ITZ, HC, ZMH, ZMA, TMA, IZP, ZSB, BM).

Notes. The interpretation of this enigmatic species has long remained uncertain, e.g., Muesebeck & Walkley (1951: 109) listed *truncator* as an "unrecognized species" in *Zele* auct. The original description is very short, but is sufficient for identification, despite the fact that the type is lost. The "much compressed, truncate" metasoma, combined with the "body pale honey-yellow, polished, impunctured" points to the genus *Homolobus* Foerster. The most commonly captured species of *Homolobus* in the faunal area wherein the type-locality is situated is *H. melleus* (Cresson, 1872), a junior synonym of *H. calcarator* (Wesmael, 1835). It is also the only species of this genus in the area that fits the original description, e.g., antenna fuscous, but honey-yellow at base (viz., scapus is yellowish), palpi whitish towards the tips (viz., the maxillary palp is often whitish apically), the propodeum "slightly punctured" (which is actually finely rugose, but in any case not areolated as in other species), and length of body, ca. 6 mm. Finally in the AMNH collection (New York) there is a damaged specimen with an old, handwritten label "*Zele* (*Bracon*) *truncatus* Say" (probably by Ashmead) which belongs to this species. For the fixation of this interpretation I have selected a neotype, which will be deposited in the RMNH-collection (Leiden). The original type-locality is "Indiana", while the neotype is from Ann Arbor, Michigan, but both are situated in the Carolinian faunal region.

The holotype of *Phylax calcarator* Wesmael, 1835, was collected nr. Charleroy, Belgium. According to the original description Wesmael had only one male at his disposal, but in the Wesmael collection four specimens with type-labels are present. Fortunately only one fits the original description, in possessing the back of the metasoma "entièrement d'un testacé comme le reste du corps" (Wesmael, 1835: 161). This specimen has been labelled holotype: the length of the body is 6.3, of fore wing 5.6 mm, antennal segments 43, length of malar space 0.6 times basal width of mandible; hind tibial spurs truncate apically, length of femur, tibia and basitarsus of hind leg 4.9, 9.8, and 8.0 times their width, respectively, and length of 1st tergite 2.9 times its apical width (KBIN, Brussels: "Coll. Wesmael", "1875", "*Phylax calcarator* mihi, ♂, det. C. Wesmael", "Type").

The lectotype of *Phylax melleus* Cresson, 1872 (ANSP, Philadelphia: "Tex.", "Type, No. 1763", "*Phylax melleus* Cress.") is damaged, viz., the metasoma is missing. The length of the fore wing is 6.5 mm, antennal segments 50, length of maxillary palp 1.2 times height of head, and femur, tibia, and basitarsus of hind leg 6.1, 10.5, and 9.5 times their width, respectively. There are two specimens in ANSP with the same printed locality-label, which have been labelled paralectotype.

The holotype of *Zele crassicalcaratus* Viereck, 1905 (SEM, Lawrence: "Aug.", "Douglas Co., Kansas, E. S. Tucker", "*Zele crassicalcaratus* Vier., Type", "617") is a typical male of *truncator* (figs. 174—176, 178—181). The metasoma, hind tibia and tarsus are absent, length of fore wing 5.3 mm, antennal segments 47, and length of hind femur 5.5 times its width.

Finally *Phylacter fuscitarsis* Bengtsson, 1918, and *Zele unicolor* Enderlein, 1920, have to be added to the synonyms of *truncator*, because no significant differences could be detected after a thorough study of the available material. In the Thomson Collection (Lund) are 7 specimens under *Phylacter chlorophthalmus* (sensu Thomson, nec Spinola), which are part of the type-series of *Phylacter fuscitarsis* Bengtsson, because in the original description the name *fuscitarsis* was proposed for the species interpreted by Thomson as *chlorophthalmus*. Therefore one ♀ (ZIL, Lund: "Ilsp, 9/7", "1977, 30") is herewith selected as lectotype of *Phylacter fuscitarsis* Bengtsson. The length of the fore wing is 5.7 mm, r : 2-SR : 3-SR : r-m = 10 : ca. 13 : 16 : ca. 9, and the telotarsi are somewhat infuscated. Paralectotypes are 3 ♀, 2 ♂, and one damaged specimen, of which the sex is unknown.

The examined type-series of *unicolor* (lectotype: figs. 112—115, 182—190) consists of 23 ♀ and 4 ♂. One ♀ is herewith selected as lectotype (PAN, Warsaw: "Costa Rica, H. Schmidt S.", "Type", "*Zele unicolor* Enderl., ♀, Type, Dr. Enderlein, det. 1918", "Mus. Zool. Polonicum, Warszawa, 12/45"), which is a quite normal specimen of *truncator*. Length of body 6.4, of fore wing 6.1 mm, length of malar space 0.6 times basal width of mandible, length of maxillary palp 1.1 times height of head, SR of hind wing weakly sinuate, length of femur, tibia, and basitarsus of hind leg 6.9, 10.3, and 8.8 times their width, respectively, length of 1st tergite 2.5 times its apical width, and length of ovipositor sheath 0.08 times fore wing. The examined holotype of *Apatia simillima* Enderlein, 1920 (chosen from the same series as *unicolor*) is also a *truncator*, but has as an additional feature the well developed notauli filled with glue (PAN, Warsaw).

Variation: length of body 5.8—8.1, of fore wing 5.3—8.2 mm; length of hind femur 4.9—7.3 times its width; length of 1st tergite 2.5—3.4 times its apical width; length of ovipositor sheath 0.06—0.08 times fore wing; antennal segments 44—54; length of maxillary palp 1.1—1.3 times height of head; length of malar space 0.5—0.7 times basal width of mandible; length of 4th segment of labial palp 4.0—5.5 times 3rd segment.

Homolobus (Apatia) rufithorax (Granger) comb. nov.
(figs. 191—203, 319, 320)

Granger, 1949, Mém. Inst. scient. Madagascar 2A: 377, 378, fig. 383 (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 226.

Lectotype, ♀, length of body 9.0, of fore wing 8.7 mm.

Head. — Antennal segments 50, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.8 and 3.4 times their width, respectively, both penultimate segments 2.0 and 2.4 times their width; length of 4th segment of labial palp 3.5 times 3rd segment; length of maxillary palp 1.2 times height of head; eyes distinctly emarginate (fig. 198); dorsal length of eye 2.0 times temple; POL : ∅ ocellus : OOL = 9 : 13 : 12; frons almost flat, with a weakly developed medial carina (fig. 199); vertex punctulate; face and clypeus rather flat, punctulate; apical margin of clypeus straight medially, not separated from the clypeus (fig. 198); length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum crenulate medially, rugose-punctate medio-ventrally, punctate dorsally, and rugose posteriorly (fig. 191); epicnemial area mainly rugose; precoxal suture widely reticulate-rugose, surrounding part of mesopleuron punctate; metapleural flange large, rounded and without carina apically; metapleuron weakly punctate dorsally, rugose ventrally; notauli narrowly crenulate anteriorly, more widely posteriorly, deep (fig. 201); mesoscutal lobes densely punctulate; surface of propodeum coarsely rugose-reticulate, without carinae (fig. 191).

Wings. — Fore wing: r : 3-SR : SR1 = 7 : 14 : 43; r wider than 3-SR; SR1 strongly curved towards R1 (fig. 196); cu-a slightly inclivous, almost straight, and shortly antefurcal; 2-M + CU1 : CU1 = 1 : 23; 2-SR : 3-SR : r-m = 11 : 14 : 7; 2A shortly developed; area basally of 2A remotely setose laterally (fig. 197). Hind wing: r absent; SR sinuate (fig. 196); SC + R1 moderately curved (fig. 194).

Legs. — Hind coxa weakly punctate; tarsal claws simple, brownish yellowish pectinate basally, except inner hind claw (figs. 202, 203); length of femur, tibia, and basitarsus of hind leg 6.6, 10.0, and 9.0 times their width, respectively; length of spurs of hind tibia 0.7 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 3.6 times its apical width, its surface weakly reticulate-rugose medially, mainly smooth laterally (fig. 320); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.04 times fore wing.

Colour. — Mesosoma, legs (but tibiae somewhat infuscated), 1st tergite (mainly), and 2nd tergite laterally, reddish-brown; pterostigma dark brown; 1st tergite medio-apically, 2nd tergite medially, 3rd and following segments mainly, blackish-brown; apical margins of tergites (except of 1st tergite) whitish-yellow; dorsal half of clypeus, face, vertex anteriorly, and eye margins, yellowish-white; remaining part of head and basal half of antenna, blackish-brown; apical half of antenna brown.

Lectotype in MNHN, Paris: "Bekily, Reg. Sud de l'Ile", "Muséum Paris, XI.36, A. Seyrig", "50", *"Zele rufithorax* Gr., B. Sigwalt". Lectotype herewith selected. From same locality 2 ♀ paralectotypes (MNHN). Additionally examined a ♀ from Malagasy (Rogez, Forêt cote est, I.31, A. Seyrig (MNHN)) with a type-label, which cannot be a type-specimen because it is not mentioned in the original description. Length of malar space 0.6 times basal width of mandible; antennal segments 49; only frons and vertex anteriorly whitish-yellow; face light reddish-brown; vein r of fore wing wider than 3-SR, length of 1st tergite 3.8 times its apical

width, mainly smooth and wholly reddish brown; margins of 2nd and 3rd tergites yellow; mesopleuron punctulate; length of fore wing 7.6 mm; length of 4th segment of labial palp 3.0 times 3rd segment; hind tarsus mainly dark brown.

Homolobus (Apatia) maculatus spec. nov.
(figs. 204—215, 283)

Holotype, ♀, length of body 5.7, of fore wing 5.6 mm.

Head. — Antennal segments 44, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 4.2 and 3.6 times their width, respectively, length of both penultimate segments 1.3 and 1.5 times their width (fig. 211); length of 4th segment of labial palp 3.5 times 3rd segment; length of maxillary palp 1.2 times height of head; eyes indistinctly emarginate (fig. 210); dorsal length of eye 2.1 times temple; POL : ∅ ocellus : OOL = 10 : 9 : 16; frons almost flat, medially mainly smooth, laterally coriaceous (fig. 213); vertex rather convex, coriaceous; face weakly punctate and convex; clypeus punctulate and with some lateral striae, convex; apical margin of clypeus straight medially, not differentiated from clypeus (fig. 210); length of malar space 1.3 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum mainly smooth dorsally, crenulate medially and rugose ventrally (fig. 204); epicnemial area weakly rugose; precoxal suture rather coarsely rugose-reticulate, posteriorly more punctate; rest of mesopleuron punctulate; metapleural flange round and wide apically, bordered by a rather narrow carina (fig. 204); notauli rather widely crenulate posteriorly (fig. 214); mesoscutal lobes punctulate; surface of propodeum narrowly smooth anteriorly and with a medium-sized medial carina, rest of propodeum finely reticulate-rugulose.

Wings. — Fore wing: r : 3-SR : SR1 = 10 : 7 : 45; r and 3-SR of equal width (fig. 206); SR1 almost straight; cu-a antefurcal, straight; 2-M + CU1 : CU1 = 1 : 19; 2-SR : 3-SR : r-m = 11 : 7 : 7; short part of 2A sclerotized (fig. 206); area basally of 2A mainly bare (fig. 208). Hind wing: r absent; SR straight; SC + R1 weakly curved (fig. 207).

Legs. — Hind coxa punctate and dorsally rugose (fig. 204); tarsal claws pectinate basally and with a rounded, tiny subapical prominence (fig. 212); length of femur, tibia, and basitarsus of hind leg 7.3, 10.8, and 9.2 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.6 times its apical width, its surface behind the spiracles reticulate-rugulose (fig. 215); dorsal carinae of 1st tergite absent except for a short basal remnant (fig. 215); length of ovipositor sheath 0.09 times fore wing.

Colour. — Yellowish-brown; apical half of antenna, vertex, stemmaticum, middle of frons, pronotum partly, margin of mesoscutum, propodeum, metanotum, 1st tergite mainly, base of 2nd tergite, apical margins of 3rd and 4th tergites, 5th—8th tergites, 5th sternite, hypopygium partly, and tarsi mainly, more or less blackish or dark brown; pterostigma brown; palpi slightly infuscated; wing

membrane weakly brownish; apical margins of 3rd and following tergites somewhat silvery.

Holotype in CNC, Ottawa: "N. Slope Mt. Elgon, Uganda, 2300 m, 17—26.x.i.1971, H.Falke". Paratypes: 8 ♀ and 4 ♂: 4 ♀, topotypic (CNC, RMNH); 1 ♂, "S. Tanganyika, Rungwe Mts., 2600 m, 5—10.xi.62 (allotype, CNC); 1 ♀, "Afr. Orient. Ang., Kenya", "Muséum Paris, Nanyuki, VI.32, A. Seyrig" (MNHN); 1 ♀, "Pietermaritzburg, XI—21—70, S. Africa, H & M. Townes" (TC); 1 ♂, "Mt. Elgon, 8000 ft, IV.9.76, Kenya, Ian Bampton" (TC); 1 ♂, "Mpendle, Natal, XII-3-70, S. Africa, H. & M. Townes" (RMNH); 1 ♀ and 1 ♂, "Kenya, Elgon Saw Mill, Mt. Elgon, Ver'est, (Camp II), 2470 m", "Muséum de Paris, Mission de l'Omo, C. Arambourg, P.-A. Chappuis & B. Jeannel, 1932—33" (MNHN); 1 ♀, "Kenya, Kitale, Uasin Gishu, 2100 m", "Muséum de Paris, Mission de l'Omo, C. Arambourg, P.-A. Chappuis & B. Jeannel, 1932—33" (RMNH).

Variation: Length of fore wing 4.6—5.6 mm; length of ovipositor sheath 0.09 times fore wing; antennal segments 43—45; length of 1st tergite 2.5—2.6 times its apical width; length of 4th segment of labial palp 3.2—3.7 times 3rd segment; length of malar space 1.2—1.6 times basal width of mandible; vein cu-a of fore wing antefurcal, interstitial, or shortly postfurcal; hind coxa sometimes only punctulate; females with at least apical third of metasoma blackish.

Notes. Male essentially as female, but tarsal prominence more reduced, scarcely visible at 80×; apices of hind tibial spurs sharp and hyaline apically. For blackish specimens from Malagasy, see note under *albipalpis*.

Homolobus (Apatia) alternipes spec. nov.
(figs. 216—230)

Holotype, ♀, length of body and of fore wing both 5.0 mm.

Head. — Antennal segments 38, 3rd segment 1.3 times 4th segment; length of 3rd and 4th segments 4.9 and 3.8 times their width, respectively, length of both penultimate segments 2.3 and 2.0 times their width (fig. 218); length of 4th segment of labial palp 4.0 times 3rd segment; length of maxillary palp 1.1 times height of head; eyes scarcely emarginate (fig. 229); length of eye 2.2 times temple; POL : ∅ ocellus : OOL = 5 : 5 : 6; vertex rather flat, rugose near eyes (fig. 227); frons rather flat, mainly smooth; face rather flat, punctate, and dorsally somewhat rugose; clypeus convex, weakly punctate; apical margin of clypeus straight medially, not differentiated from clypeus (fig. 229); length of malar space 0.7 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.5 times its height; side of pronotum crenulate-rugose medially and posteriorly, coarsely rugose ventrally, and dorsally narrowly punctulate (fig. 216); epicnemial area reticulate-rugose posteriorly; precoxal suture densely rugose-reticulate; mesopleuron above precoxal suture finely punctate; metapleural flange lamelliform, large, wide and rounded apically; metapleuron dorsally mainly smooth, reticulate-rugose ventrally (fig. 216); notauli

largely narrowly crenulate, apically wider and more reticulate-rugose (fig. 228); mesoscutal lobes densely punctulate; surface of propodeum coarsely reticulate-rugose, but anteriorly narrowly smooth, with a short medial carina.

Wings. — Fore wing: r : 3-SR : SR1 = 6 : 5 : 42; SR1 straight; cu-a straight, postfurcal; 1-CU1 : 2-CU1 = 2 : 16 ; 2-SR : 3-SR : r-m = 10 : 5 : 6; 2A shortly sclerotized basally; area basally of 2A mainly bare (fig. 221). Hind wing: r absent; SR straight; SC + R1 weakly curved (fig. 220).

Legs. — Hind coxa coarsely punctate-rugose dorsally, more punctulate laterally (fig. 223); tarsal claws slender, setose, with only a scarcely visible (at 80×) subapical prominence (figs. 225, 226); length of femur, tibia, and basitarsus of hind leg 5.8, 9.3, and 7.6 times their width, respectively; length of spurs of hind femur 0.6 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 2.6 times its apical width, its surface largely finely rugose, mediobasally and apically smooth (fig. 224); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.09 times fore wing.

Colour. — Mesosoma brownish-red; head, antenna, pterostigma, parastigma, wing veins, metasoma, and hind leg (except for the whitish trochanter and trochantellus), more or less dark brown; palpi, fore and middle coxae, all trochanters and trochantelli, tegulae, and (to a lesser degree) fore and middle femora, yellowish-white; margin of 2nd tergite, mandibles and anellus, yellowish; fore and middle tibiae and tarsi yellowish, but somewhat infuscated.

Holotype in MNHN, Paris: "Kenya, Nairobi, 1600 m", "Muséum Paris, VI.32, A. Seyrig". Paratypes: (2♂), 1 ♂, "Meru, VI.32", "Muséum Paris, Kenya, A. Seyrig" (allotype, MNHN). Length of malar space 0.8 times basal width of mandible; r : 3-SR = 10 : 7; antennal segments 39; apices of spurs of hind tibia sharp and hyaline; 1st tergite mainly smooth; pronotum remotely rugose; length of 4th segment of labial palp ca. 4.5 times 3rd segment; mesopleuron above precoxal suture punctulate; apical 0.4 of precoxal suture only punctulate; length of fore wing 4.4 mm; claws without prominence. Second paratype without head, 1 ♂, same labels as allotype (RMNH), pronotum only slightly punctate, precoxal suture mainly rugose-reticulate, and above precoxal suture punctate.

Homolobus (Apatia) priapus (Nixon) comb. nov.
(figs. 138—140, 231—239)

Nixon, 1938, Bull. ent. Res. 29: 418, 419, fig. 1b (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 225.

Holotype, ♀, length of body and of fore wing both 7.2 mm.

Head. — Antennal segments 48, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 3.7 and 3.1 times their width, respectively, length of both penultimate segments 2.0 and 2.3 times their width; length of 4th segment of labial palp ca. 4 times 3rd segment; length of maxillary palp 1.4 times height of head; eyes weakly emarginate (fig. 238); dorsal length of eye 2.3 times temple; POL : ∅ ocellus : OOL = 3 : 8 : 5; frons rather flat, anteriorly rugose; vertex punctate-

rugose, rather flat (fig. 138); face mainly flattened, largely rugose, laterally coriaceous; clypeus rather flat, punctulate; apical margin of clypeus straight medially, narrowly differentiated from clypeus (fig. 238); length of malar space 0.8 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum largely rugose, apico-dorsally and ventrally partly smooth (fig. 231); epicnemial area reticulate-rugose; precoxal suture weakly impressed, coarsely rugose-reticulate; rest of mesopleuron densely and finely punctate; metapleural flange large, with a rather narrow lamella apically (fig. 231); metapleuron punctate, but ventrally reticulate-rugose; notauli densely crenulate (fig. 239); mesoscutal lobes densely punctulate; surface of propodeum largely reticulate-rugose, posteriorly with a transverse carina, area behind it almost smooth, medial carina absent.

Wings. — Fore wing: r : 3-SR : SR1 = 8 : 9 : 43; SR1 straight; cu-a inclivous, but apically straight, postfurcal; 1-CU1 : 2-CU1 = 1 : 21; 2-SR : 3-SR : r-m = 11 : 9 : 8; 2A well developed basally (fig. 234); area basally of 2A mainly bare. Hind wing: r absent; SR straight; SC + R1 almost straight (fig. 232).

Legs. — Hind coxa finely and densely punctate, but postero-dorsally more coriaceous (fig. 139); tarsal claws setose, with a (at 80 ×) rather well visible, small prominence (fig. 237); length of femur, tibia, and basitarsus of hind leg 7.0, 10.5, and ca. 10 times their width, respectively; length of spurs of hind tibia 0.7 and 0.6 times basitarsus.

Metasoma. — Length of 1st tergite 3.2 times its apical width, its surface largely reticulate-rugose, basally smooth (fig. 140); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.08 times fore wing.

Colour. — Brownish-yellow; stemmaticum dark brown; apices of antennal segments of apical half of antenna, labial palp and ovipositor sheath, somewhat infuscated.

Holotype in BM, London: "Type", "B.M. Type Hym. 3. c. 679", "*Zele priapus* Nixon, ♀, Holotype", "Cape Province, Somerset East, 10-22.xii.1930", "S. Africa, R. E. Turner, Brit. Mus. 1931—37". Paratypes: 1 ♀ (topotypic) and 7 ♂ (Katberg and Ceres, both S. Africa). Additional specimens examined (33 ♀ and 18 ♂) are all from South Africa (Jonkershoek, nr. Stellenbosch; Garies, Cape; Grahamstown; Magoebaskloof, nr. Tzaneen; Kirstenbosch, nr. Cape Town; Deepwalls Forest, Knysma, C. P.) (TC, HC, RMNH). Variation: length of fore wing 6.2—8.1 mm; length of 4th segment of labial palp 3.3—5.5 times 3rd segment; length of malar space 0.7—1.0 times basal width of mandible; antennal segments 44—48; whole metasoma yellowish; only claws of male with a small subapical prominence; hind tibial spurs of male sharp and hyaline apically; vein cu-a of fore wing antefurcal, interstitial, or shortly postfurcal; length of vein r of fore wing equal to vein 3-SR, or shorter.

Homolobus (Apatia) lacteiceps spec. nov.
(figs. 240—254)

Holotype, ♀, length of body 8.0, of fore wing 7.9 mm.

Head. — Antennal segments 49, 3rd segment 1.3 times 4th segment; length of 3rd and 4th segments 4.0 and 3.2 times their width, respectively, length of both penultimate segments 2.1 and 2.7 times their width; length of 4th segment of labial palp 2.4 times 3rd segment; length of maxillary palp 1.3 times height of head; eyes weakly emarginate (fig. 245); dorsal length of eye 2.6 times temple; POL : ∅ ocellus : OOL = 7 : 11 : 7; frons smooth, except for some lateral striae, rather flat medially, convex laterally; vertex rather flat and smooth (fig. 242); face rather flat, largely punctulate, dorsally weakly rugulose; clypeus convex, punctulate; apical margin of clypeus straight medially, not differentiated from clypeus (fig. 245); length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum largely smooth, medially and posteriorly crenulate-rugose (fig. 240); epicnemial area almost smooth anteriorly, reticulate-rugulose posteriorly; precoxal suture largely reticulate-rugulose, anteriorly and posteriorly only indistinctly sculptured (fig. 240); rest of mesopleuron punctulate; metapleural flange small, with a narrow rounded carina apically (fig. 240); metapleuron medially smooth, anteriorly crenulate, and ventrally rugose; notauli narrowly crenulate (fig. 250); mesoscutal lobes punctulate; surface of propodeum reticulate-rugose, laterally with some more coarse rugae, medial and transverse carinae absent.

Wings. — Fore wing: r : 3-SR : SR1 = 8 : 11 : 41; SR1 straight; cu-a strongly inclivous, slightly bent basad apically (fig. 243), postfurcal; 1-CU1 : 2-CU1 = 5 : 32; 2-SR : 3-SR : r-m = 20 : 22 : 11; 2A unsclerotized, only completely pigmented (fig. 243); area basally of 2A setose (fig. 247). Hind wing: r absent; SR weakly curved basally, strongly sinuate submedially; constriction of marginal cell distad from its middle (fig. 243); SC+R1 distinctly curved (fig. 254); 2-SC+R subquadrate.

Legs. — Hind coxa in dorso-apical half striate, rest punctulate (fig. 240); tarsal claws simple, yellowish pectinate basally (figs. 251, 252); length of femur, tibia, and basitarsus of hind leg 6.0, 10.0, and 8.8 times their width, respectively; length of spurs of hind tibia 0.6 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 2.7 times its apical width, its surface anteriorly mainly smooth, posteriorly rugose, and medially finely rugulose (fig. 253); dorsal carinae of 1st tergite absent, except for a faint trace anteriorly; exserted ovipositor longer than 1.5 times length of 1st tergite (fig. 240); length of ovipositor sheath 0.25 times fore wing.

Colour. — Brownish-yellow; basal third of antenna and most wing veins, dark brown; stemmaticum blackish, rest of head whitish.

Holotype in TC, Ann Arbor: "Zika Forest, Uganda, VIII.19.'63, G. Lancaster". Paratypes: (6 ♀ and 1 ♂), all from Zika Forest, Uganda (1♂ (allotype), 23.viii.1963 (TC); 2 ♀, 21.viii.1963; 2 ♀ (Mengo), 18.x.1963; 2 ♀ (Mengo, Entebbe), 13.iv.1964) (TC, RMNH). Variation: hind tibial spurs of male narrowly truncate and pigmented apically; length of ovipositor sheath 0.22—0.26 times fore wing; length of 4th segment of labial palp 2.2—2.4 times 3rd segment; antennal segments 48—52; length of fore wing 5.8—9.6 mm; length of malar space 0.5—0.6 times basal width of mandible; area basally of 2A sometimes rather bare; middle lobe of

mesoscutum punctate or punctulate; occiput sometimes with a dark bronze patch behind the stemmaticum.

Homolobus (Apatia) pulchricornis (Nixon) comb. nov.
(figs. 141—143, 255—262, 279—282)

Nixon, 1938, Bull. ent. Res. 29: 420, 421, fig. 1a (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 225.

Holotype, ♂, length of body 8.3, of fore wing 7.8 mm.

Head. — Remaining antennal segments 6, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.8 and 3.4 times their width, respectively; length of 4th segment of labial palp ca. 2.5 times 3rd segment; length of maxillary palp 1.3 times height of head; eyes rather emarginate (fig. 261); dorsal length of eye 1.8 times temple; POL : ∅ ocellus : OOL = 5 : 7 : 6; frons almost flat, smooth; vertex flat, indistinctly coriaceous-punctulate (fig. 143); face rather flat, weakly and finely punctulate-rugose medially; clypeus flattened, sparsely punctulate; apical margin of clypeus straight medially, not well differentiated from clypeus (fig. 261); length of malar space 0.6 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum rugose, dorsally and medio-ventrally smooth (fig. 255); epicnemial area crenulate anteriorly, almost smooth dorsally; precoxal suture rather coarsely reticulate-rugose; rest of mesopleuron somewhat superficially punctulate; metapleural flange rather large, lamelliform, rounded apically (fig. 255); metapleuron remotely punctate, only ventrally rugose; notauli densely crenulate (fig. 262); middle lobe of mesoscutum densely and finely punctate, lateral lobes indistinctly punctulate; surface of propodeum rather finely rugose, only anteriorly smooth (except medially), carinae absent.

Wings. — Fore wing: r : 3-SR : SR1 = 8 : 12 : 51; SR1 curved towards R1; cu-a inclivous, postfurcal; 1-CU1 : 2-CU1 = 4 : 20; 2-SR : 3-SR : r-m = 13 : 12 : 7; 2A unsclerotized, only as a pigmented stripe (fig. 258); area basally of 2A remotely and sparsely setose. Hind wing: r absent; SR distinctly curved basally and sinuate medially; marginal cell constricted in front of middle of cell (fig. 258); 2-SC+R subquadrate; SC+R1 curved (fig. 259).

Legs. — Hind coxa mainly finely punctate-rugose, laterally almost smooth (fig. 141); tarsal claws simple, yellowish pectinate basally (fig. 260); length of femur, tibia, and basitarsus of hind leg 6.0, 10.3, and 8.8 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus, roundly truncate and pigmented apically (fig. 256).

Metasoma. — Length of 1st tergite 2.8 times its apical width, its surface finely and densely reticulate-rugose (fig. 142); dorsal carinae of 1st tergite absent.

Colour. — Brownish-yellow; stemmaticum, mesoscutal lobes partly, and antenna (as far as present), more or less dark brown; behind stemmaticum a faint, somewhat darker patch; pterostigma light yellowish.

Holotype in BM, London: "Type", "B.M. Type Hym. 3.c.681", "*Zele*

pulchricornis Nixon, 1938, Type, ♂", "1938/18", "Port St. John, Pondoland, July 10—31, 1923", "S. Africa, R.E. Turner, Brit. Mus., 1923—398". One further specimen examined (♀, TC, allotype, "Gillitts, nr. Durban, XII-1-70, So. Africa, H. & M. Townes") on which the following addition is based. Antennal segments 47, length of both penultimate segments 2.1 and 2.5 times their width; length of 4th labial palp segment 1.9 times 3rd segment; length of malar space 0.6 times basal width of mandible; length of fore wing 9.1 mm; length of ovipositor sheath 0.14 times fore wing, slender, light yellowish; exserted ovipositor slightly longer than 1st tergite (fig. 280); length of 1st tergite 2.7 times its apical width, its surface finely and densely rugulose; antenna yellowish, except for the eight dark brown basal segments; 2-SC + R shortly transverse (fig. 279); mesoscutum darkened anteriorly; mesoscutum densely and finely punctate; face, frons and vertex light yellowish.

Homolobus (Apatia) huddlestoni spec. nov.
(figs. 263—277)

Holotype, ♀, length of body and of fore wing both 7.5 mm.

Head. — Apex of antenna missing, remaining segments 24, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 3.5 and 2.9 times their width, respectively; length of 4th segment of labial palp 1.8 times 3rd segment; length of maxillary palp 1.1 times height of head; inner sides of eyes moderately emarginate (fig. 270); dorsal length of eye 2.6 times temple; POL : ∅ ocellus : OOL = 5 : 7 : 3; frons rather flat, striate (fig. 270); vertex narrow, concave near eyes, microsculptured (fig. 275); face rather flat, dorsal half transversely and finely striate, ventrally punctulate; clypeus rather flat, punctulate; apical margin of clypeus straight medially, not differentiated (fig. 270); length of malar space 0.7 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum crenulate medially and apically, punctate dorsally, and mainly smooth ventrally; epicnemial area reticulate-rugulose; precoxal suture reticulate-rugulose, weakly impressed; metapleural flange large, rounded and lamelliform apically (fig. 263); metapleuron almost smooth, only ventrally with some rugae; notauli almost smooth anteriorly, crenulate-rugose posteriorly (fig. 274); mesoscutal lobes punctulate; surface of propodeum densely and finely rugulose (fig. 263), without carinae.

Wings. — Fore wing: r : 3-SR : SR1 = 13 : 17 : 81; SR1 weakly curved towards R1; cu-a inclivous, postfurcal; 1-CU1 : 2-CU1 = 1 : 11; 2-SR : 3-SR : r-m = 18 : 17 : 10; 2A shortly sclerotized basally (fig. 266); area basally of 2A mainly remotely setose (fig. 276). Hind wing: r absent; 2-SC + R quadrate; SC + R1 almost straight (fig. 267); SR weakly sinuate (fig. 266).

Legs. — Hind coxa finely punctate-reticulate dorsally (fig. 269); tarsal claws simple, and basally rather indistinctly yellowish pectinate, but inner hind claw only setose (fig. 268); length of femur, tibia, and basitarsus of hind leg 5.3, 8.6, and 7.6 times their width, respectively; length of spurs of hind leg 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.0 times its apical width, robust (fig. 271), its surface finely and densely rugulose and apically more striate; dorsal carinae of 1st tergite absent, except for a weak basal remnant; length of ovipositor sheath 0.07 times fore wing.

Colour. — Brownish-yellow; stemmaticum blackish; flagellum and stripe on outer side of scapus, brownish; pterostigma yellowish.

Holotype in BM, London: "Tanganyika, Ilonca, 1.10.1962, I: A. D. Robertson", "Ex pupa *Euproctis sanguiguttata*", "*Zele* sp., R. D. Eady det. 1964".

The note that it emerged from the pupa of the host needs to be checked. Paratypes: (8 ♀ and 7 ♂), 3 ♂ (one allotype, BM): "E.A. Forest Insect Survey, J. C. M. Gardner, Tanganyika, Mbulu, ex larva *Euproctis fasciata* Wlk., No. 1238", "R. 662, 2.7.54" (BM, RMNH); 1 ♀ "Ukiriguru T.T., Castor, 29.III.1958, J. A. Robertson, Y. 129", "*Zele* sp. nr. *chlorophthalmus* Nees, R. D. Eady, det. 1959" (BM); 1 ♀, "Mtwapa, Kenya, Date 10.8.1971, No. 10718, B. R. Adams Coll., ex larvae of PC 6599" (BM); 1 ♂, "S.Rhodesia, Fort Victoria, IV.1957, Min. Agric.", "Ex larva of Lepidopt. No. 8007", "Larva No. 8007 = *Euproctis rubricosta* Fawcett" (BM); 1 ♀, topotypic (BM); 1 ♀, "Jinja, Uganda, 26.II.1909, C. C. Gowden No. 3" (RMNH); 1 ♀, "Uganda, Kampala, 5.x.1929, G. L. R. Hancock, ex *Arctornis rubricosta* on cvHorn (?)", "0356", "*Zele* sp. n., Holotype, ♀, R. D. Eady, det. 1970" (RMNH); 1 ♀, "Entebbe, Mengo, V.11'64, Uganda, G. A. Lancaster" (TC); 2 ♂, "Madagascar, Bekily, Reg. Sud de l'Ile", "Muséum Paris, IX.36, A. Seyrig" (MNHN); 1 ♂, "Madagasc.: Fort Dauphin, A. Seyrig" (MAC); 1 ♀, "Coll. Mus. Congo, Tanganika: Kamena, 1400 m (Riv. Kinga), H. Bomans, I.1958" (MAC); 1 ♀, "Musée du Congo, Kibali-Ituri: Geti, 1934, Ch. Scops" (RMNH). Variation: length of fore wing 5.3—6.8 mm; antennal segments 42 or 43; length of both penultimate segments in figured apex of antenna (fig. 264) 1.6 and 1.9 times their width; length of 4th segment of labial palp 1.7—2.0 times 3rd segment; length of malar space 0.5—0.7 times basal width of mandible; length of hind femur 4.6—5.8 times its width, robust; hind tibial spurs of male sharp and hyaline apically (figs. 272, 273); vein 2-SC + R quadrate or higher than wide; length of 1st tergite 1.7—2.2 times its apical width; length of ovipositor sheath 0.04—0.08 times fore wing.

Notes. The hosts of this new species seems to be restricted to the Lymantriidae (Lepidoptera), which is an aberrant choice within the genus *Homolobus*.

It is a real pleasure to dedicate this species to Mr. T. Huddleston (London); without his spontaneous assistance this revision (and others) would be far less complete.

Homolobus (Apatia) ophioninus (Vachal) comb. nov.
(figs. 278, 287—301)

Vachal, 1907, Revue Ent. 26: 122 (as *Meteorus*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 83.

Holotype, ♀, length of body 5.7, of fore wing 6.2 mm.

Head. — Antennal segments 46, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 3.4 and 2.8 times their width, respectively, length of both penultimate segments 1.6 and 2.0 times their width; length of 4th segment of labial palp 2.8 times 3rd segment; length of maxillary palp equal to height of head; eyes weakly emarginate (fig. 301); dorsal length of eye 2.3 times temple; POL : ∅ ocellus : OOL = 8 : 10 : 9; frons flat, largely rugulose, medially mainly smooth (fig. 299); vertex convex, somewhat coriaceous; face rather flat, dorsally shortly transversely rugulose and punctate, ventrally punctulate (fig. 301); clypeus rather convex, punctulate; apical margin of clypeus almost straight medially, not differentiated from clypeus; length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.5 times its height; side of pronotum dorsally and ventrally smooth, medially and posteriorly crenulate-rugose (fig. 287); epicnemial area finely reticulate-rugose as main part of precoxal suture, posterior third of precoxal suture only punctate and rather flat; rest of mesopleuron indistinctly punctulate; metapleural flange rather small, rounded and lamelliform apically (fig. 287); metapleuron largely smooth, ventrally reticulate-rugose; posteriorly notauli closely crenulate (fig. 300), anteriorly narrow and almost smooth; surface of propodeum smooth anteriorly, rest mainly superficially transversely rugulose-coriaceous; medial carina of propodeum shortly developed anteriorly.

Wings. — Fore wing: r : 3-SR : SR1 = 9 : 18 : 77; SR1 rather curved towards R1 (fig. 289); cu-a inclivous, postfurcal, somewhat curved basad apically; 1-CU1 : 2-CU1 = 2 : 35; 2-SR : 3-SR : r-m = 15 : 18 : 11; 2A distinctly sclerotized basally (fig. 288); area basally of 2A sparsely setose (less than in figured specimen, fig. 288). Hind wing: r absent; 2-SC + R transverse (fig. 289); basally SR less sclerotized than 1r-m, weakly sinuate; SC + R1 rather straight (fig. 290).

Legs. — Hind coxa mainly smooth, somewhat punctulate (but in figured specimen finely reticulate-rugose dorsally, fig. 291); tarsal claws simple, only basally indistinctly yellowish pectinate (figs. 294, 295); length of femur, tibia, and basitarsus of hind leg 6.5, 10.5, and 9.0 times their width, respectively; length of spurs of hind tibia 0.7 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.4 times its apical width, its surface mainly smooth, only posteriorly somewhat pimply-rugose (cf. fig. 298); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.07 times fore wing, rather slender.

Colour. — Brownish-yellow; antenna apically, and outer side of scapus, slightly infuscated; pterostigma (rather light) brown; stemmaticum blackish; wing membrane subhyaline.

Holotype in MNHN, Paris: "Don de Mme Jaubert", "Muséum Paris, 1939, Capit Quod", "G. *Meteorus* sp. *ophioninus* Vach., ♀, Usumia". The type originates from New Caledonia.

Specimens additionally examined: 100 ♀ and 42 ♂. From the Australian region: Australia: New South Wales (Narrabri; Maitland; Willowtree; 12 mi. NW. Milton), Western Australia (Old Doongan; 10 mi. W. Mellewa; Yallingup; Millstream; S. Coolgardie; 10 mi. S. Geraldton; 10 mi. W. Eucla; 5 mi. NW.

Augusta; Wongan Hills; 13 mi. NEE. Caiguna; 21 mi. NE. Fraser Range; 19 mi. NE. Mundrbilla), Southern Australia (9 mi. E. Cook; Mambray Creek; Leigh Co.; 35 mi. ESE. Morgan; 5 mi. S. Mungewarrie Sta.; 35 mi. E. Ceduna; Old Alton Downs, Simpson Desert; Goyder Lagoon, Waterhole; 10 mi. ESE. Koonalda), South Western Australia (Lake Magenta, at flowers of *Eucalyptus*), Australian Capital Territory (2 mi. E. Mt. Coree; Canberra), Northern Territories (Tempe Downs; 36 km SW. Borroloola). New Caledonia (Noumea). Norfolk Islands (Burnt Pine, 370 ft; Duncombe Bay, 300 ft; J. E. Road, 200 ft) (RMNH, CSIRO, CNC, BM, CAS, BPBM). From the Afrotropical and S. Palaearctic regions: Persia (Beshire (? = Beshneh, S. Iran)), Ethiopia (Addis-Abbeba; Haut-Aduache, Endessa; Karssa; Debra Zeit, 7200 ft), Kenya (S.W. Elgon, 6700 ft (specimen figured); Naivasha; Nairobi; Muguga; Mau Escarpment, Molo, 2420 m; Mt. Kenya, West side, lower zone, Ngaré Rungai, prairie river, 2000 m; Wa-Kikuyu, Wambogo, 1750 m; Elgon Saw Mill, Mt. Elgon, 2470 m; Mt. Elgon, 2100 m; Meru), Tanzania (Kilimandjaro, Kibonoto culture zone; id., Himo River, 1000 m, lower zone), Malagasy (Ftanaransoa, Plateau Central; Bekily, Reg. Sud de l'Ile; Tananarive; Banian, 70 m, Ankazoabo; Périnet; Andronotobaka, 1400 m, Ambatolampy; Montagne d'Ambre, Les Roussettes, 1100 m; Ankàsoka, 1130 m, Route Lakete; Ankaratra, 1800 m; La Mandraka; Antsirabé), Ruanda (Nyabikenke, Nyanza Terr., 1700 m; Sabiro, 1300 m), Zaire (Lomani, Kaniama; Ituri, Blukwa; Lualaba, N'Zilo, N. Kolwezi, 1400 m; Kolwezi, Mulando; Lubumbashi), Zambia (Welsley), and Rhodesia (Marandellas) (BM, MNHN, ZSB, RMNH, MAC, TC, TMA, CNC, NR). Variation: Length of fore wing 5.8—9.0 mm; antennal segments 45—51; length of malar space 0.3—0.7 times basal width of mandible; length of hind femur 5.0—6.9 times its width; spurs of hind tibia of male truncate and pigmented apically (figs. 296, 297); length of 4th segment of labial palp 1.8—2.8 times 3rd segment; length of 1st tergite 1.9—2.5 times its apical width; length of ovipositor sheath 0.05—0.08 times fore wing; colour of pterostigma varies from yellowish-brown to more or less dark brown; sometimes mesosoma with dark patches (especially at the middle of the mesoscutal lobes); 2nd tergite rather whitish laterally; sometimes mesosoma with dark patches (especially at the middle of the mesoscutal lobes); metasoma partly, apex of hind femur, and main part of hind tibia and tarsus sometimes infuscated; vein 2-SC + R of hind wing shortly transverse. Cocoon white and thin.

Notes. This species is closely related to *australiensis*, which differs mainly by the presence of the black-and-white pattern of the metasoma. Known hosts of reared specimens are *Spodoptera exempta* Walker and *Agrotis segetum* (Denis & Schiff.), both belonging to the Noctuidae (Lepidoptera).

Homolobus (Apatia) truncatoides spec. nov.
(figs. 302—314, 324—326)

Holotype, ♀, length of body 5.2, of fore wing 5.0 mm.

Head. — Antennal segments 42, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.2 and 2.8 times their width, respectively, length of both penultimate segments 1.7 and 2.0 times their width; length of 4th segment of labial

palp 1.8 times 3rd segment; length of maxillary palp equal to height of head; eye weakly emarginate (fig. 311); dorsal length of eye 2.1 times temple; POL : ∅ ocellus : OOL = 12 : 10 : 13; frons mainly flat and smooth, only behind antennal sockets some sculpture (fig. 312); vertex convex, smooth; face rather flat, transversely rugulose-punctulate (fig. 311); clypeus rather convex, punctate; apical margin of clypeus straight medially, not differentiated from clypeus; length of malar space 0.9 times basal width of mandible; upper condyli of mandibles distinctly below lower level of eyes (fig. 311).

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum smooth, but medially crenulate and posteriorly reticulate-rugose (fig. 302); epicnemial area and precoxal suture densely reticulate-rugose; rest of mesopleuron smooth, except for some punctures near the pleural suture; metapleural flange medium-sized, rounded and with a narrow carina apically (fig. 302); metapleuron smooth, only ventrally rugose; notauli crenulate (fig. 325); mesoscutal lobes weakly punctulate; surface of propodeum densely and rather finely reticulate-rugose, except for a narrow anterior part smooth and with a short medial carina anteriorly.

Wings. — Fore wing: r : 3-SR : SR1 = 6 : 10 : 47; SR1 almost straight, but slightly curved (fig. 306); cu-a weakly inclivous, postfurcal; 1-CU1 : 2-CU1 = 6 : 37; 2-SR : 3-SR : r-m = 10 : 10 : 6; 2A sclerotized basally (fig. 306); area basally of 2A sparsely setose (fig. 304). Hind wing: r absent; SR weakly sinuate, scarcely sclerotized (fig. 306); 2-SC + R transverse; SC + R1 rather short and weakly curved (fig. 307).

Legs. — Hind coxa largely punctulate, dorsally mainly rugulose; tarsal claws simple, only yellowish setose, outer hind claw rather spiny setose (figs. 313, 314); length of femur, tibia and basitarsus of hind leg 7.1, 10.2, and 8.8 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 3.2 times its apical width, its surface longitudinally reticulate-rugose (fig. 326); dorsal carinae of 1st tergite absent, except for a weak remnant; length of ovipositor sheath 0.04 times fore wing; sheath truncate apically (fig. 303).

Colour. — Brownish-yellow; antenna (except inner side of scapus, pedicellus, and anellus), all tarsi, middle of mesoscutal lobes, metanotum partly, 1st and 2nd tergite, more or less brownish infuscated; wing membrane hyaline; pterostigma light brown.

Holotype in ZMB, Berlin: "Egypten, Schmiedekn. S., 1897", "Heliopolis bei Cairo", "28642", "*Phylacter nigricornis* Walk., ♀♂" (in Schmiedeknecht's handwriting), "Zool, Mus. Berlin". Paratypes: (40 ♀ and 30 ♂) from the Afrotropical region: 1 ♂, "Kenton-on-Sea, South Africa, XII.1—11.1970, Rex Jubb" (TC); 1 ♂, "S. Africa, R. E. Turner, Brit. Mus. 1922—97", "Mossel Bay, Cape Province, Febr. 1922" (BM); 1 ♀, id., 15.iii—20.iv.1932 (RMNH); 1 ♀, id., Febr. 1922 (BM); 1 ♀, "Madagascar, Tananarive, 6—13.x.1970", "Coll. P. Hammond, B.M. 1970-603" (BM); 1 ♀, "Nyassa See, Langenburg, VI.98, Fülleborn S.", "*Zele nigricornis* Walk." (in Szépligeti's handwriting), "Zool. Mus. Berlin" (ZMB); 1 ♂, "Coll. Mus. Congo, Madagascar: Ankaratra, IV-1944, A.

Seyrig" (MAC); 2 ♂, "Muséum Paris, Afrique occidentale, Konakry, A. Chevalier, 1909", "Décembre" (MNHN, RMNH); 1 ♀, "Ilora, Nigeria, VIII'74, W. State, J. T. Medler" (TC); 2 ♀, "Grahamstown, South Africa, I.17—31.71 & II.15—22'71, Fred Gess" (TC, RMNH); 1 ♂, St. Lucia Estuary, XI.10, 70, So. Africa, H. & M. Townes" (TC); 1 ♀, "Kenton-on-Sea, South Africa, XII.1.11, 1970 (RMNH); 1 ♂, id., January 1971 (TC); 2 ♀, id., II.1—19, 1971 (TC); 1 ♂, id., XI.15—30, 1970 (RMNH); 2 ♀, id., XI.1—14, 1970 (TC, RMNH); 2 ♀, id., March 1971 (TC); 1 ♀, id., April 1971 (TC); 2 ♀, id., June 1971 (TC); 1 ♀, "Madagascar, Antsirabé", "Muséum Paris, XI.36, A. Seyrig", "*Zele chlorophthalmus* Nees, B. Sigwalt" (RMNH); 1 ♀, "Madagascar, Ankaratra, Alt. 1800 (m)", "Muséum Paris, II.38, A. Seyrig", "48", "*Zele chlorophthalmus* Nees, B. Sigwalt" (MNHN); 1 ♀, "Muséum Paris, Madagascar, Région du Sud-est, Forêt Dauphin, Ch. Allaud, 1901", "*Zele nigricornis* Walker" (in Szépligeti's handwriting), "*Zele chlorophthalmus* Nees, B. Sigwalt" (MNHN); 2 ♀ and 1 ♂, "Muséum Paris, Zambéze, Nova Choupanga, près Chemba, P. Lesne, 1929", "*Zele chlorophthalmus* Nees, B. Sigwalt"; 1 ♂, "Muséum Paris, Madagascar, Tananarive, R. Decary, 1921", "Février", "*Zele chlorophthalmus* Nees, B. Sigwalt" (MNHN); 1 ♀, "Muséum Paris, Ethiopie Mérid., Haut-Aduache, Endessa, Maurice de Rothschild, 1905", "*Zele nigricornis* Walk., V. Szépligeti, det. 1907" (TMA); 1 ♀, "Madagascar, Perinet, XI-7-1959", "E. S. Ross Collector" (CAS)). From the South Palaearctic region: 3 ♂, "Aegyptus, Schmkn., 97", "Memphis", "*Zele nigricornis* Walk., det. Szépligeti (TMA, RMNH); 1 ♂, "Alexandria, Egypt", "*Zele chlorophthalmus* (Nees), det. P. Marsh" (USNM); 1 ♂, "Spain, Almeria, El Alquinan, 3 March 1966, Leif Lyneborg" (UZM); 4 ♀ and 4 ♂, "Museum Leiden, Bär, Blöte, De Jong & Osse, Estepona, 3.X.1952, Spanje" (RMNH); 2 ♀ and 2 ♂, id., but 30 km ZW. Malaga, 4.X.1952 (RMNH); 1 ♂, id., but from Jerez de la Frontera, 22.IX.1952 (RMNH); 1 ♂, "Islas Canarias, Tenerife, J. Wolschrijn", "Los Cristianos, 13/26.ii.1977" (RMNH); 1 ♂, "Almunecar, Granada Prov., Spain, 0—30 m, J. R. Vockeroth, 16.VII.1960" (CNC); 1 ♂, "nr. Limassol, XI.21'46, Cyprus Mavroumoustakis" (TC); 1 ♀ and 2 ♂, "Cyprus, Yermasovia R., 25.XI.66, 4.XI.1967, and 12.V.1966, respectively, Mavroustakis" (CNC, RMNH); 1 ♂, Italy, "Palermo, XI.63" (TC); 2 ♀ and 1 ♂ from Iraq: "Loc. Hindiya, 31/10/ 1956", "Host (on) *Beta*, Coll. S. Alyasiri", "*Zele* cf. ♀ *calcarator* ♀", "8/11/195.", "Host (on) sugar beet, Coll. D. Ahmad", "*Zele* cf. *calcarator*" (HC), and "Iraq, Diwanyye, 12-9-1954, light trap", "*Zele* cf. *calcarator* ♂" (HC); 1 ♀ and 1 ♂, "El Riyadh; Saudi Arabia, 9.X.1959, E. Diehl" (CNC, RMNH)). And from the Oriental Region: 1 ♀, "1400 ft, Coimbatore, South India, XI.1966, P. S. Nathan" (CNC); 1 ♀, "India, Mysore, 10 mi. NW. Kittur, 15.II.1962, E. S. Ross & D. Q. Cavagnaro" (CAS); 1 ♀, "Malaya, Cameron Highlands, Mt. Brichang, 2—7.I.59" (BPBM); 2 ♀, "India, A. P., Warangal, A. R. S. Coll." (DZD, RMNH); 1 ♀, "India, U.P., Dehra Dun, 600 m, 8.IV.1976, S. Biswas No. B13" (DZD). Specimens excluded from the type-series: 1 ♂, "Kandy, Ceylon, W. Horn", "Co-type", "*Macrocentrus ceylonicus* Enderl., ♂, Type, Dr. Enderlein det. 1912". A wrongly identified specimen, still belonging to the type-series of *Metapleurodon ceylonicus* (Enderlein) (PAN). Furthermore 1 ♀, "Jonkershoek, near Stellenbosch, X.8.70, S.

Africa, H. & M. Townes" (TC), excluded from the type-series because of the colour and sculpture. Middle of frons, stemmaticum, middle of mesoscutal lobes, antenna apically, pterostigma, propodeum, meso- and metapleura dorsally, 1st tergite, base of 2nd tergite and tarsi, more or less dark brown; 2nd tergite is somewhat rugulose basally; 1 ♂, "Kenton-on-Sea, South Africa, April 1971, Rex Jubb" (TC), excluded because the apices of the hind tibia are sharp and hyaline.

Variation: length of fore wing 3.5—7.1 mm, antennal segments 39—44; length of 4th segment of labial palp 1.6—2.5 times 3rd segment; length of 1st tergite 1.7—2.6 times its apical width; length of malar space 0.8—1.1 times basal width of mandible; length of hind femur 5.6—6.3 times its width, exceptionally 4.9 times; hind tibial spurs of male (sub)truncate and pigmented apically (figs. 308, 310); length of ovipositor-sheath 0.08 times fore wing; claws at most indistinctly yellowish pectinate basally; apical width of marginal cell 1.9—2.2 times its maximum basal width.

Homolobus (Apatia) pallidistigmus (Cameron) comb. nov. (figs. 327—331, 334—340, 709, 712)

Cameron, 1911, Ann. Transv. Mus. 2: 210 (as *Macrocentrus pallidistigmas*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 166.

Holotype, ♂, length of body 9 (according to Cameron), of fore wing 8.9 mm, metasoma and hind leg absent.

Head. — Remaining antennal segments 12, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 2.9 and 2.6 times their width, respectively; length of 4th segment ca. twice 3rd segment; length of maxillary palp about equal to height of head; inner sides of eyes rather emarginate (fig. 330); POL : ∅ ocellus : OOL = 9 : 9 : 7; frons mainly rugose, flat (fig. 328); vertex superficially punctulate; face densely punctulate, near eyes and near clypeus almost smooth, rather flat; clypeus almost smooth, superficially and remotely punctulate, flattened; apical margin of clypeus somewhat convex medially, not differentiated from clypeus (fig. 330); length of malar space ca. 0.8 times basal width of mandible; upper condyli of mandibles distinctly below lower level of eyes (fig. 330).

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum ventrally smooth, medially crenulate, posteriorly and dorsally closely punctate (fig. 327); epicnemial area densely punctate; precoxal suture shallow, densely punctate; rest of mesopleuron finely punctulate, almost smooth; metapleural flange large, lamelliform, rounded apically (fig. 327); notauli deep and finely crenulate (fig. 331); surface of propodeum densely punctate-rugose, but almost smooth anteriorly, without carinae medially.

Wings. — Fore wing: r : 3-SR : SR1 = 10 : 17 : 73; SR1 curved (fig. 329); cu-a subinterstitial, inclivous, and somewhat curved basad apically; 2-SR : 3-SR : r-m = 17 : 17 : 10; 2A sclerotized basally (fig. 329); area basally of 2A remotely setose. Hind wing: r absent; 2-SC+R transverse; SR weakly sinuate, basally rather sclerotized (fig. 329); SR+R1 straight (fig. 337); apical width of marginal cell 2.4 times its maximum basal width.

Legs. — Middle coxa smooth; middle spurs of hind tibia 0.3 times basitarsus, subequal.

Colour. — Brownish-yellow; stemmaticum blackish; pterostigma mainly light yellowish; according to the original description the apical half of the antenna is black.

Holotype in TMP, Pretoria: "Rietf., 11.2.05, 11." (= Rietfontein, Pretoria District, S. Africa), "*Macrocentrus pallidistigmus* Cam., Type" (in Cameron's handwriting). Additional specimens examined (17 ♀ and 14 ♂) from Kenya (Karen, Nairobi; nr. Nairobi, 6000 ft), Uganda (Zika Forest, Mengo; Kampala; Katona, Mujenje), Tanzania (W. Usambara Mts., 2100 m, Magamba; Mt. Meru, 1800 m; Chome, Pare Mts., 1800 m), and Zaire (Rutshuru) (TMA, MAC, RMNH, CNC, TC).

Variation: Length of fore wing 7.0—9.5 mm; antennal segments 54 in one ♀; length of 4th segment of labial palp 2.6—2.8 times 3rd segment; length of malar space 0.8—1.1 times basal width of mandible, exceptionally 0.6 or 0.7 times; length of 1st tergite 2.8—3.4 times its apical width (fig. 334); length of hind femur 6.9—7.0 times its width (fig. 338); length of ovipositor sheath 0.04—0.06 times fore wing (fig. 335); tibial spurs of hind leg of males truncate and pigmented apically, rather slender (figs. 709, 712); claws simple, more or less pectinate basally (figs. 339, 340); apical width of marginal cell of hind wing 2.4—2.6 times its maximum basal width; antenna more or less yellowish-brown.

Notes. *Homolobus* (*Apatia*) *pallidistigmus* (Cameron) belongs to a group of four species, which are sometimes difficult to separate. The two most closely allied species being *ophioninus* and *truncatoides*, while *huddlestoni* is related to *ophioninus* but rather easily recognizable, these three being usually somewhat smaller than *pallidistigmus*. *H. ophioninus* is separable by the rather transverse frontal aspect of the head, because of the highly situated upper condyli of the mandibles. While *truncatoides* has a more trapezoidal frontal aspect of the head as in *pallidistigmus*, the latter differs from *truncatoides* by a more widened marginal cell of the hind wing, a (usually) more developed basal third of vein SR of hind wing, and a more straight SC + R1. Because the variation is considerable, a careful examination is needed to arrive at a reliable identification. The shape of the hind tibial spurs of the males, for instance, may be useful; in *pallidistigmus* the spurs are rather slender apically, while in *ophioninus* and usually also in *truncatoides* they are stout apically. Because of the variation other characters have to be considered as well! *Macrocentrus pallidistigmus* Cameron sensu Szépligeti belongs to "*Macrocentrus*" *albitarsis* Granger, 1949.

Subgenus **Chartolobus** nov.

Etymology: from "charta" (Latin for "lamina") and "lobus" (Latin for "protuberance"), because of the more or less developed ventral lamella of the claws. Gender: masculine.

Type-species: *Zele infumator* Lyle.

Diagnosis. — Length of body 7.1—14.6, of fore wing 7.0—15.9 mm; antennal

segments 46—52, its 3rd—6th segments of ♀ with a ridge at the inner side (figs. 348, 366, 877, 878); length of 4th segment of labial palp 3.0—4.0 times 3rd segment; length of maxillary palp 1.5—1.7 times height of head; apical margin of clypeus straight medially and more or less differentiated from clypeus (figs. 344, 374); length of malar space 0.4—0.8 times basal width of mandible; temples roundly (fig. 347) or directly (fig. 375) narrowed apicad; length of hind femur 6.1—7.8 times its width; claws with a subapical tooth or lamella (figs. 350, 364); inner hind claw of ♀ concave and bare ventro-basally (figs. 351, 365, 888); hind telotarsus of ♀ more or less bare near base of inner hind claw (fig. 888); apices of hind tibial spurs of ♂ sharp and hyaline; 1A + 2A of fore wing curved (figs. 353, 369, 380); basal third of SR of hind wing mainly sclerotized (figs. 349, 368, 379), curved (fig. 343) or almost straight (fig. 379); SC + R1 of hind wing curved (figs. 349, 382); r of hind wing absent; length of 1st tergite 2.1—3.1 times its apical width; 2nd tergite smooth; length of ovipositor sheath 0.04—0.07 times fore wing; posterior part of propodeum more or less separated from antero-dorsal part by a transverse carina (figs. 341, 352, 358, 729), both in about the same plane.

Distribution. — One of the three species has an immense distribution; it ranges from the South Neotropical region (Argentina), through the Holarctic region as far as the Oriental region (Indonesia). Both other species occur in the Australian region, and *H. undulatus* occurs also in the Oriental region.

Key to the species of the subgenus *Chartolobus*

1. Vein 2A of fore wing widened basally and apically if compared with the surrounding veins (figs. 368, 369, 379, 380); Indo-Australian 2
— Vein 2A of fore wing slender, not or slightly widened if compared with surrounding veins (figs. 343, 353); Neotropical, Holarctic, Oriental . . . . *infumator* (Lyle) (p. 305)
2. Vein SR of hind wing weakly curved basally (fig. 368); vein 2A of fore wing less widened (fig. 369); face more shiny and punctulate (fig. 360); pterostigma light brownish or yellowish brown; hind tarsus yellowish or whitish; Indo-Australian . . . . *undulatus* spec. nov. (p. 309)
— Vein SR of hind wing straight basally or nearly so (figs. 379, 382); vein 2A of fore wing strongly widened (fig. 380); face rugulose-coriaceous laterally and rather dull (fig. 374); pterostigma and hind tarsus blackish; Australian . . . . *nigritarsis* spec. nov. (p. 310)

Homolobus (Chartolobus) infumator (Lyle) comb. nov.
(figs. 171—173, 341—353, 877, 878, 888)

Nees von Esenbeck, 1834, Hym. Ichn. affin. Mon. 1: 202, 203 (as *chlorophthalmus*, nec Spinola, 1808!).
Lyle, 1914, Entomologist 47: 288, 289, figs. 2, 5, 9 (as *Zele*).
Bengtsson, 1918, Acta Univ. lund. (2)14(32): 39, 41 (*Phylacter wesmaeli*). **Syn. nov.**
Watanabe, 1932, Insecta matsum. 6: 135 (*Zele testaceator* f. *japonica*).
Watanabe, 1969, Proc. ent. Soc. Wash. 71: 319—324, fig. 7.

Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 224.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 230, 231.
Čapek, 1972, Ent. Problémy 10: 133, 136.
Kabatsjinskajte & Jakimavičius, 1973, Acta ent. Lituanica 2: 86.
Jakimavičius, 1974, Tr. AN Lit. SSR B2(66): 97.
Čapek, 1975, Biológia 30: 819.
Van Achterberg, 1976b, Tijdschr. Ent. 119: 73, figs. 103, 104.
Tobias, 1976, Opr. Fauna SSSR 110: 133, fig. 39: 5, 6.

Redescribed after the lectotype of *H.* (*C.*) *wesmaeli* (Bengtsson), ♂, length of fore wing and of body both 7.1 mm.

Head. — Antennal segments 37, but apical segments absent, 3rd segment 1.3 times 4th segment, length of 3rd and 4th segments 4.0 and 3.2 times their width, respectively; length of maxillary palp 1.5 times height of head; eyes weakly emarginate (fig. 344); dorsal length of eye 1.6 times temple; temple rounded apicad (fig. 347); POL : ⌀ ocellus : OOL = 8 : 7 : 6; frons almost smooth and flat; vertex smooth; face rather flat, transversely rugose-striate, but triangular area above clypeus smooth (fig. 344); clypeus rather flat, superficially punctulate, almost smooth; length of malar space 0.7 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum superficially punctulate, with some short crenulae medially (fig. 341); epicnemial area almost smooth; precoxal suture anteriorly finely rugose, its posterior half smooth (fig. 341); rest of mesopleuron indistinctly punctulate; metapleural flange large, lamelliform, rounded apically; metapleuron punctulate; notauli finely crenulate (fig. 172); mesoscutal lobes punctulate; surface of propodeum smooth, except for some rugae medially and irregular medial and transverse carinae, with an arc-shaped carina posteriorly, enclosing a small semicircular areola (cf. fig.352).

Wings. — Fore wing: r : 3-SR : SR1 = 7 : 13 : 54; SR1 slightly curved (fig. 343); cu-a shortly antefurcal, straight; 2-M + CU1 : CU1 = 1 : 22; 2-SR : 3-SR : r-m = 12 : 13 : 9; 2A sclerotized and slender basally (fig. 353); area basally of 2A bare except for some setae basally. Hind wing: Basal third of SR sclerotized and curved (fig. 343); SC + R1 strongly curved (fig. 349); marginal cell distinctly constricted (fig. 343).

Legs. — Hind coxa smooth; tarsal claws with a subapical tooth (fig. 345); length of femur, tibia and basitarsus of hind leg 7.0, 10.9, and 9.0 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.4 times its apical width, its surface smooth (fig. 346); dorsal carinae of 1st tergite absent.

Colour. — Brownish-yellow; stemmaticum dark brown.

Lectotype in KBIN, Brussels: "Coll. Wesmael", "1876", "*Phylax chlorophthalmus* N.V.Es., ♂ ♀, dét. C. Wesmael", "Type". Lectotype of *Phylacter wesmaeli* Bengtsson, 1918, herewith selected, and labelled accordingly. There are in the Wesmael Collection two other heavily damaged specimens with simple claws which probably belong to *truncator*.

The type-series of *Zele infumator* Lyle consists of 11 ♀ and 13 ♂, of which several are reared from *Alcis repandata* (L.) and one ♀ from *Agonopterix*

alstroemeriana (Clerck), is in the BM collection (London). One ♂ (glued on a card with a red dot, "type", and "530", with a whitish cocoon, "B.M. Type Hym., 3.c.56", "*Zele infumator* Lyle", "G. T. Lyle, New Forest, 31.5.10, Ex *B.* (= *Boarmia*) *repandata*", "G. T. Lyle Coll., B.M. 1930—579") is herewith selected as lectotype. The propodeum is strongly areolate (fig. 352), the 1st tergite somewhat reticulate-punctate and its length 2.2 times its apical width, and wings slightly infumated apically.

The type of *H.* (*C.*) *japonicus* (Watanabe) is a normal specimen of *infumator,* with rather whitish hind tarsi, a feature not uncommon in New World populations. The holotype is a ♀, housed in EI, Sapporo: "23.X.1924, Takao, Takeuchi", "*Zele testaceator* Curtis f. *japonicus,* Type", "Type Hym. 22 No. 22".

Additionally examined specimens: 209 ♀ and 106 ♂. From the Neotropical region: Argentina (S. Pedro d. Colalao, 1200 m; Horco Molle, nr. Tucumán; Villa Nogues; Tafi del Valle), Peru (Dept. Lima, Matucana, 2389 m), Bolivia (Coroico, Yungas La Paz; Coroico, 1800 m), and El Salvador (Monte Cristo, 2300 m). From the Nearctic region: Mexico (Chis., 7200 ft, S. Crist. las Casas; Chis., 9600 ft, Zontehuitz, nr. S. Crist.; Dgo., 30 mi. W. La Cuidad, 6500 ft; id., 24 mi. W. La Cuidad, 7000 ft; Dgo., 9000 ft, 10 mi. W. El Salto), California (Skyline Blvd., San Mateo Co.; Mill Valley, Marin Co.; Orinda Village, Contra Costa Co., San Pablo Ridge, below Eureka peak, 1000—1200 ft, oak-chaparral zone; Julian; Lake Wohlford; Forest Glen, 2300 ft, Trinity Co., black light), Nevada (Lee Cyn., 40 mi. NW. Las Vegas, Clark Co., 7400—7500 ft; Baker Creek Camp, 8 mi. W. Baker, White Pine Co., 7700 ft), Arizona (5 mi. W. Portal, Cochise Co., 5400 ft; Huachuca Mts., Cochise Co., Floor of Carr Cyn, 5400 ft; id., 15 mi. S. Sierra Vista, Ramsey Cyn., 5000—6000 ft; Hidden Springs Cyn., 4875 ft, 12 mi. S. Sonoita; Canelo, Santa Cruz Co.; Portal), New Mexico (Cimarron Cyn., 7900 ft, Sangre de Cristo Mts., Colfax Co., black light; Ute Park, 7300 ft), Colorado (Saguache Co., Valley View Springs, ca. 7 mi. E. of Mineral Hot Springs on W. foot of Sangre de Cristo Range, ca. 8500 ft), Utah (Whiterock, 7300 ft), Florida (Waldo; Hawthorne), Montana (Missoula, 3000 ft), Illinois (no locality), South Carolina (Wattacoo, Pickens Co.), Minnesota (Big Fork), Washington (19 mi. NW. Newport, 2850 ft), Maine (Dryden), New Brunswick (Charls Fork, N. Branch), Quebec (L. Expanse; La Tugie; Otter Lake; Lake Mondor, Ste. Flore, at light), Ontario (Ottawa, Dow's Swamp; Sudbury), and British Columbia (Victoria; Squamish, Diamond Head Trail, 3200 ft; Great Central L.; 28 mi. S. Radium Hot Springs, 2600 ft).

From the Palaearctic region: Finland (Helsinki; Somerniemi; Lappträsk; Ruokolanti), USSR (Vilnius, Verkiat, Lit. SSR; Armenia, Tsav, Jabl. sad), Sweden (Skåne), Denmark (Veldes; Hannenvo, Falster; Egebjeggd, Nordfyn; Odense), East Germany (Berlin), West Germany (Steinebach am Wörthsee; Haffen; Lüneburgerheide; Gräfelfing; Reither Alm, 850 m; Rheinhöhenweg im Kottenforst (nr. Bonn); Mainz; Spessart, Lochmühle), Ireland (Drinnahilly, C. Do.; Tollymore Pk., Co. Do.; Bansla Wd., Co. St.; Old Head, Co. Wm.; Lodge Wds, Glengariff, Co. Wo.), England (Essex, Round Stone (in Curtis Collection, under *chlorophthalmus*); Hants., New Forest, Minstead), Netherlands (Dorst, nr. Breda; Valkenswaard; Harskamp; Amersfoort, Den Treek; Putten (Gld.);

't Harde; Hilversum; Hoog Soeren; Vierhouten; Heerde; Nunspeet; Crailo; Den Dolder; Ede (Gld.); Loenen; Muiderberg; Naardermeer; Overveen; Melissant; Chaam; Amsterdamse Duinwaterleiding, nr. Vogelenzang; Tegelen; Molenven (? nr. Oisterwijk); Oostkapelle; Oploo; Venlo; Bergen op Zoom), France (Jura, Baudiette), Spain (Huesca, Torla, 1035 m), Italy (Garda Lake, Malcesini, 300 m; Süd-Tirol, Cortina d'Ampezzo, Pokol, 1527 m; Tirol, Leutaschstrasse nr. Mittenwald, ca. 1000—1100 m; San Marino, Marche; Riva s. Garda, 250 m), Austria (Styr., Podčetrtek; Nordkitte, 2000 m; Styria m., Sausal-Gebirge, Kitzeck, 300—500 m), Czechoslovakia (Radošima, 8 km SE. Piest'any, Povazsky Inovex; Hostýn-okoli, Mor. or.), Romania (Transsylv. Alp., Cibins. Mts., Hohe Rinne), Greece (Ellas, Kerkyra, Dassia, 5 km SE. Korakiana), Nepal (Ktmd., Pulchauki, 8000 ft), and Japan (Mie Honshu; Kyoto, Honshu; Nagano, Honshu; Sapporo; Jokohama; Hirakura, Mie Honshu). From the Oriental region: Taiwan (Sunmoon Lake), Philippines (Baguio, Benguet), India (U.P., 8000 ft, Chakrata), and Indonesia (Java, Kenden(g) Ridge, 1500 m) (RMNH, ITZ, EI, CNC, BM, MSU, AMNH, CAS, UCA, TC, UZM, HC, ZMH, ZMB, IZP, ZSB, USNM, NMV).

Variation: Length of fore wing 6.8—10.0 mm; antennal segments 46—50; flagellum of antenna often dark brown of blackish basally; cu-a of fore wing shortly antefurcal, interstitial or shortly postfurcal; 2-SC + R sometimes quadrate; cocoon whitish or yellowish; length of ovipositor sheath 0.05—0.07 times fore wing; length of malar space 0.3—0.7 times basal width of mandible.

Known hosts of examined specimens: *Lambdina fiscellaria* (Guenée), *L. somniaria* (Hulst), *Nepytia canosaria* (Walker), *Alcis repandata* (L.), *Lycia zonaria* (Denis & Schiff.), *Ematurga atomaria* (L.) (all belonging to the Geometridae), and *Agonopterix alstroemeriana* (Clerck), the latter belonging to the Oecophoridae.

Note. Nees (1834) has used the name *chlorophthalmus* in the genus *Rogas* probably (at least partly) for this species and referred to the description of *Bracon chlorophthalmus* Spinola, 1808, in this manner devaluing his description to merely a misidentification of Spinola's species, as pointed out under *Zele chlorophthalmus* in this paper (p. 372). The misinterpretation was accepted by Wesmael (1835), whose two specimens still exist. Through the action of Bengtsson (1918), who renamed *chlorophthalmus* sensu Wesmael as *wesmaeli*, they became part of the type-series of *Homolobus* (*C.*) *wesmaeli* (Bengtsson, 1918). In the Wesmael Collection there are one ♂ and two damaged specimens, probably females. In his description Wesmael stated that he possessed one ♂ and one ♀, of which the ♂ had the metasoma darkened dorsally. This male is selected as lectotype of *wesmaeli* in this paper; the lectotype is a specimen of *infumator*, which is a senior synonym of *wesmaeli*. The interpretation of *chlorophthalmus* sensu Nees (nec Spinola & Haliday) is uncertain and his specimens are lost. I have rejected the interpretation by Nixon (1938), because Wesmael is the first revisor of Nees' interpretation and the lectotype of *wesmaeli* fits well the description by Nees. The species which is named *Homolobus truncator* (Say) in this paper, was named *Zele chlorophthalmus* sensu Nees by Nixon (1938).

Homolobus (Chartolobus) undulatus spec. nov.
(figs. 358—369, 729, 730)

Holotype, ♀, length of body 14.6, of fore wing 15.9 mm.

Head. — Antennal segments 52, ridge of 4th—6th segments undulate (fig. 366), 3rd segment 1.3 times 4th segment, length of 3rd and 4th segments 3.5 and 2.8 times their width, respectively, length of both penultimate segments 2.0 and 2.4 times their width; length of maxillary palp 1.7 times height of head; eyes rather emarginate (fig. 360); dorsal length of eye 2.2 times temple; temple directly narrowed posteriad (fig. 363); POL : ∅ ocellus : OOL = 6 : 13 : 8; frons somewhat concave medially, mainly smooth; vertex flat, somewhat punctulate and coriaceous; face mainly flat, punctulate; clypeus weakly convex, punctulate (fig. 360); length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum smooth, except for some short crenulae medially and somewhat rugose posteriorly (fig. 358); epicnemial area punctulate; precoxal suture crenulate antero-dorsally, densely punctate antero-ventrally, and its posterior half finely punctulate, as rest of mesopleuron (fig. 358); metapleural flange large, lamelliform, sharp apically, and with a medial carina; metapleuron punctulate, ventrally with some carinae; notauli rather narrow and mainly smooth (fig. 359); surface of propodeum smooth, but medially carinate-rugose, with irregular lateral and transverse carinae (fig. 729).

Wings. — Fore wing: r : 3-SR : SR1 = 11 : 22 : 77; SR1 weakly curved (fig. 368); cu-a weakly inclivous, postfurcal; 1-CU1 : 2-CU1 = 2 : 27; 2-SR : 3-SR : r-m = 19 : 22 : 12; 2A strongly widened and sclerotized basally (figs. 368, 369); area basally of 2A mainly bare. Hind wing: Basal third of SR sclerotized and curved (fig. 368); SC + R1 strongly curved (fig. 367); marginal cell distinctly constricted.

Legs. — Hind coxa punctulate; tarsal claws with a rather large ventral lamella, which is sharp apically, setose (figs. 364, 365); length of femur, tibia and basitarsus of hind leg 7.8, 11.9, and 10.2 times their width, respectively; length of spurs of hind tibia 0.5 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 3.1 times its apical width, its surface mainly smooth, laterally and posteriorly somewhat rugulose (fig. 729); dorsal carinae of 1st tergite weakly developed in front of spiracles; length of ovipositor sheath 0.04 times fore wing.

Colour. — Brownish-yellow; stemmaticum blackish; surroundings of stemmaticum somewhat infuscated.

Holotype in RMNH, Leiden: "Neth. Ind.-Amer. New Guinea Exped., 2800 m, Moss Forest Camp, 18.X.1938, L. J. Toxopeus leg.". For location of the camp, see Toxopeus (1940). Paratypes: (10 ♀ and 8 ♂) from New Guinea (1 ♂, allotype, "N.E. New Guinea, Eastern Highlands, Mt. Wilhelm, VI.1965, Research Station, v. Balgooy"; 2 ♀, "Net. Ind.-Amer. New Guinea Exp., 1938, Lake Habbema, 3250—3300 m, ult. VII-ult. VIII., L. J. Toxopeus leg."; 1 ♀, "Museum Leiden, Nieuw Guinea Exp., K.N.A.G. 1939, Paniai, 19.XI.1939", (all RMNH); 1 ♂, "New Guinea (NE), Morobe, Mt. Kaindi, 2350 m, X.1974"; 1 ♀, "New Guinea, NE., Mt. Kaindi, 2350 m, 12.xi.1964" (both BPBM)), Australia (1♀ (TC), "Mt.

Cootha, Qld., V.1—17, Australia"), Indonesia (1 ♀ (RMNH), "Dammerman, Idjen, 950 m, Blawan, VI.1924"; 1 ♂ (RMNH), "Museum Leiden, J. v. d. Vecht, G. Bentang, III.1938"; 1 ♀ (RMNH), "Museum Leiden, J. v. d. Vecht, G. Tjangkoedang, Djampang Wetan, XI.1938"), India (2 ♀ (CNC, RMNH), "Anamalai Hills, Cinchona, India, 3500′ (ft), IV.1957, P. S. Nathan"; 2 ♂ (CNC, RMNH), "Anamalai Hills, Madras St., S. India, 3500′ (ft), V.1963, P. S. Nathan" 2 ♂ (CNC), "Devala, Nilgiri Hills, 3200′ (ft), S. India, X.1960, P. S. Nathan"), and Taiwan (1 ♀ (TMA), "Formosa, Sauter", "Chip-Chip, (1)909, II"; 1 ♂ (TC), "Bukai, Formosa, VI—11'34", "L. Gressitt Collector").

Variation: Length of fore wing 10.7—15.7 mm; antennal segments 47—52; length of malar space 0.4—0.8 times basal width of mandible; length of maxillary palp 1.5—1.7 times height of head; length of 1st tergite 3.0—3.1 times its apical width, length of ovipositor sheath 0.05 times fore wing (in five specimens measured); hind tarsus sometimes rather whitish-yellow or whitish, mesoscutum partly and apex of metasoma sometimes infuscated; vein 2-SC + R sometimes quadrate.

Homolobus (Chartolobus) nigritarsis spec. nov.
(figs. 370—384)

Holotype, ♀, length of body 12.3, of fore wing 12.0 mm.

Head. — Antennal segments 51, 3rd—7th segments with a rather straight ridge (fig. 381), 3rd segment 1.4 times 4th segment, length of 3rd and 4th segments 4.7 and 3.4 times their width, respectively, length of both penultimate segments 2.0 and 2.1 times their width; length of maxillary palp 1.5 times height of head; eyes weakly emarginate (fig. 374); dorsal length of eye 2.6 times temple; temple directly narrowed posteriad (fig. 375); POL : ∅ ocellus : OOL = 11 : 10 : 8; frons concave, smooth; vertex almost flat, indistinctly coriaceous; face almost flat, mainly rugulose-coriaceous and rather dull, but medially punctulate and more shiny (fig. 374); clypeus convex, punctulate; length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum medially and posteriorly crenulate, and dorsally somewhat punctate (fig. 370); epicnemial area smooth, except fore some punctulation; anterior half of precoxal suture shallowly crenulate dorsally and punctate ventrally, its posterior half smooth dorsally and finely punctate ventrally; rest of mesopleuron smooth, except for some punctulation; metapleural flange large, rounded apically, lamelliform, with carinae (fig. 370); metapleuron smooth dorsally, reticulate ventrally; notauli indistinctly crenulate, only posteriorly wider crenulate (fig. 384); surface of propodeum coarsely and remotely reticulate, anteriorly and posteriorly narrowly smooth.

Wings. — Fore wing: r : 3-SR : SR1 = 13 : 21 : 60; SR1 almost straight (figs. 379); cu-a almost straight, postfurcal; 1-CU1 : 2-CU1 = 3 : 25; 2-SR : 3-SR : r-m = 18 : 21 : 12; 2A very wide and sclerotized basally (figs. 379, 380); area basally of 2A bare, basally and ventrally brownish pigmented (fig. 380). Hind wing: Basal fifth of

SR sclerotized, rather straight (fig. 379); SC + R1 rather curved (fig. 382); marginal cell scarcely constricted.

Legs. — Hind coxa punctulate; tarsal claws with a sharp subapical lamelliform tooth (fig. 378), setose, and basally indistinctly pectinate, except inner hind claw (fig. 383); length of femur, tibia, and basitarsus of hind leg 6.1, 9.7, and 7.2 times their width, respectively; length of spurs of hind tibia 0.7 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 3.1 times its apical width, its surface posteriorly and laterally partly rather weakly reticulate-rugose (fig. 372); dorsal carinae of 1st tergite shortly developed basally; length of ovipositor sheath 0.06 times fore wing.

Colour. — Brownish-yellow; stemmaticum, antenna (but scapus and pedicellus somewhat reddish), apical 0.6 of hind tibia, hind tarsus (but telotarsus rather reddish), pterostigma, parastigma, and most wing veins, more or less dark brown; basal half of wing membrane yellowish, its apical half infumate.

Holotype in RMNH, Leiden: "Neth. Ind.-American New Guinea Exped., Araucaria Camp, 800 m, 23.iii.1939, L. J. Toxopeus". For location of the camp, see Toxopeus (1940). Paratypes: 1 ♀, 2 ♂; 1♂ (TC), "Wau & Mt. Kaindi, 4—6500′ (ft), N. Guinea, June 17—22, 1962, Bernd Heinrich"; 1 ♂ (TC), "Wau, N. Guinea, October, 1969, P. Shanahan"; 1 ♀ (BPBM), "New Guinea (NE), Wau, Morobe Distr., 1200 m, 11—18.x.1961". Length of fore wing 9.1—11.1 mm, antennal segments 49 (one ♂), length of 1st tergite 3.1 times its apical width, body partly rather whitish yellowish; antenna of ♀ paratype baso-ventrally undulate and lamelliform, as in *undulatus*.

Subgenus **Homolobus** Foerster

Foerster, 1862, Verh. naturh. Ver. preuss. Rheinl. 19: 256.
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 221.

Type-species: *Phylax discolor* Wesmael.

Diagnosis. — Length of body 5.1—11.5, of fore wing 5.3—10.6 mm; antennal segments 42—48, its 3rd—6th segments of ♀ with a longitudinal ridge at the inner side (figs. 391, 424, 451); length of 4th segment of labial palp 3.5—6.0 times 3rd segment; length of maxillary palp 1.2—1.7 times height of head; apical margin of clypeus straight (fig. 388) or rather convex (fig. 411) apically, not (fig. 461) or weakly (fig. 445) differentiated from clypeus; length of malar space 0.4—1.3 times basal width of mandible; eyes weakly emarginate (figs. 388, 411); temples roundly (fig. 409) or directly (fig. 429) narrowed posteriad; length of hind femur 5.8—6.9 times its width; claws with a small subapical tooth (fig. 426), bifurcate (fig. 406), with a lamella (fig. 392), or double lamella (fig. 394); inner hind claw of ♀ concave and glabrous ventro-basally (figs. 427, 439, 452, 885—887); hind telotarsus of ♀ more or less bare near base of inner hind claw (figs. 885—887); apices of hind tibial spurs of ♂ sharp and hyaline (fig. 410); 1A + 2A of fore wing straight (figs. 396, 436); basal third of SR of hind wing only pigmented, unsclerotized, straight or nearly so (figs. 402, 446, 469); SC + R1 of hind wing straight (fig. 404) or weakly curved (fig. 434); r of hind wing absent (fig. 396) or present (fig. 469); length of 1st

tergite 1.7—3.0 times its apical width; 2nd tergite smooth (fig. 400) or sculptured (fig. 414); length of ovipositor sheath 0.06—0.39 times fore wing; posterior part of propodeum not (fig. 444) or distinctly (fig. 401) separated from antero-dorsal part.

Distribution. — The subgenus *Homolobus* is restricted to the Palaearctic and Afrotropical regions. Because the shape of the inner hind claw of the ♀ is unknown, the relationship of *rugosus*, and to a lesser degree of *simplex*, with the other species of the subgenus is uncertain. The Palaearctic has three species: one widely distributed Palaearctic species (*discolor*), and two East Palaearctic species, of which *simplex* is an aberrant species, not closely related to *dauricus*.

There are four Afrotropical species, of which one (*rugosus*) is very aberrant, but the other three are closely interrelated. One of them is restricted to the African continent (*ethiopicus*), while two others are restricted to Malagasy.

Key to the species of the subgenus *Homolobus*

1. Claws bifurcate (fig. 406); 2nd tergite rugose (fig. 414); vertex punctate (fig. 409); vein SC + R1 of hind wing short, R1 mainly absent, and hamuli separated from R1 (fig. 412); Malagasy . . . . *rugosus* spec. nov. (p. 314)
— Claws with lamella (figs. 390, 394) or with a small subapical tooth (fig. 426); 2nd tergite smooth (fig. 428); vertex punctulate (fig. 429); vein SC + R1 of hind wing longer, R1 present, short, and hamuli situated at R1 (fig. 425) 2
2. Claws of ♀ and fore claw of ♂ with a ventral lamella (figs. 390, 392), middle and hind claws of ♂ with a 2nd lamella situated on the 1st lamella (figs. 393, 394); propodeum coarsely areolate, with its surface mainly smooth (fig. 400); East Palaearctic . . . . *simplex* (Watanabe) (p. 313)
— Claws of ♀ and ♂ with a subapical tooth (figs. 426, 443); propodeum not areolate, or, if areolate, then surface densely rugose posteriorly (fig. 431) 3
3. Precoxal suture, its surroundings and hind coxa coarsely sculptured (figs. 416, 431); at least base of palpi infuscated; vein r of hind wing absent (fig. 418); Afrotropical 4
— Precoxal suture (except anteriorly), its surroundings and hind coxa at most punctulate, usually smooth (figs. 459, 467); palpi whitish or yellowish; vein r of hind wing present (figs. 460, 469); Palaearctic 6
4. Second tergite whitish; subapical tooth of tarsal claws of ♀ scarcely visible at 80 × (fig. 443) or, if easily visible, then length of ovipositor sheath 0.14—0.17 times fore wing; Malagasy 5
— Second tergite dark brown and partly reddish- or yellowish-brown; subapical tooth of tarsal claws of ♀ easily visible at 80 × (figs. 452, 455); length of ovipositor sheath 0.07—0.08 times for wing; African Continent . . . . *ethiopicus* spec. nov. (p. 318)
5. Length of ovipositor sheath 0.14—0.17 times fore wing, about as long as apical height of metasoma, slender as ovipositor (fig. 416); subapical tooth of tarsal claws of ♀ well visible at 80 ×, small (figs. 426, 427) . . . . *cingulatus* (Granger) (p. 315)
— Length of ovipositor sheath 0.06—0.09 times fore wing, distinctly shorter than

apical height of metasoma, rather stout as ovipositor (fig. 431); subapical tooth of tarsal claws of ♀ scarcely visible at 80 ×, minute (figs. 439, 443) . . . . *inopinus* spec. nov. (p. 316)

6. Length of ovipositor sheath 0.09—0.12 times fore wing, short (fig. 459); propodeum without an areola, smooth, except for some rugae (fig. 459); mesopleuron smooth (fig. 459); Palaearctic . . . *discolor* (Wesmael) (p. 319)

— Length of ovipositor sheath 0.36—0.39 times fore wing, comparatively long (fig. 467); propodeum with a suboval areola, surrounded by rugosity (fig. 467); mesopleuron punctulate (fig. 467); East Palaearctic . . . . *dauricus* Shestakov (p. 320)

Homolobus (Homolobus) simplex (Watanabe) comb. nov.
(figs. 385—400)

Watanabe, 1932, Insecta matsum. 6: 135, 136, fig. (as *Zele*).
Watanabe, 1969, Proc. ent. Soc. Wash. 71: 319, 324, 325, figs. 4, 5.
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 226.

Holotype, ♀, length of body 9.6, of fore wing 9.7 mm.

Head. — Remaining antennal segments 26, apical segments missing, 3rd segment 1.3 times 4th segment, length of 3rd and 4th segments 4.4 and 3.5 times their width, respectively; length of maxillary palp 1.5 times height of head; dorsal length of eye 2.1 times temple; temple roundly narrowed posterially (fig. 387); POL : ∅ ocellus : OOL = 4 : 8 : 5; frons almost flat and smooth; vertex dull, flat and coriaceous (fig. 387); face rather flat, laterally rather dull, coriaceous, medially rugulose; clypeus remotely punctate, rather convex; apical margin of clypeus not differentiated, rather thick, and almost straight medially (fig. 388); length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum rugose and crenulate medially, ventrally and dorsally mainly smooth (fig. 385); epicnemial area rugose; precoxal suture largely reticulate, smooth apically; rest of mesopleuron punctulate; metapleural flange large, sharp and narrowly lamelliform apically (fig. 385); metapleuron largely punctulate, coarsely rugose ventrally; notauli extensively crenulate (fig. 398); mesoscutal lobes punctulate; surface of propodeum coarsely areolated, the enclosed areas smooth and with a short medial carina anteriorly (fig. 400); posterior part of propodeum not well separated from antero-dorsal part (fig. 385).

Wings. — Fore wing: r : 3-SR : SR1 = 9 : 15 : 53; SR1 almost straight (fig. 396); cu-a inclivous, shortly postfurcal; 1-CU1 : 2-CU1 = 2 : 23; 2-SR : 3-SR : r-m = 13 : 15 : 7; 2A sclerotized basally (fig. 396); area basally of 2A bare except for ca. 8 setae apically. Hind wing: r absent; SC + R1 weakly curved (fig. 399).

Legs. — Hind coxa punctate dorsally, punctulate laterally; hind tarsal claws absent; fore and middle claws with a rather large ventral lamella, yellowish pectinate; length of femur, tibia and basitarsus of hind leg 6.2, 10.0 and 8.2 times their width, respectively; length of spurs of hind tibia 0.8 and 0.6 times basitarsus.

Metasoma. — Length of 1st tergite 2.6 times its apical width, its surface reticulate-rugose, medially weakly developed, with a smooth tubercle apically (fig. 400); dorsal carinae of 1st tergite absent; 2nd tergite smooth; length of ovipositor sheath 0.06 times fore wing.

Colour. — Brownish-yellow; stemmaticum and apices of antennal segments (except scapus and pedicellus), blackish.

Holotype in EI, Sapporo: "Hokkaido, Uchida/Jôzankei, 15/8-1925", "Type", "*Zele simplex* Watanabe, ♀, Type", "Type Hym. No. 23". One ♂ additionally examined: (EI) "Sapporo, Hokkaido, 17.VII.1964, H. Takada", "*Zele simplex* Watanabe, ♂, Det. C. Watanabe, 1969", with very peculiar middle and hind tarsal claws (figs. 393, 394), ventrally with a double lamella. Fore claw as in ♀, length of fore wing 8.6 mm, length of 1st tergite 2.5 times its apical width, weakly rugulose, further as holotype.

Homolobus (Homolobus) rugosus spec. nov.
(figs. 401—414)

Holotype. ♂, length of body 11.5, of fore wing 10.6 mm.

Head. — Remaining antennal segments 34, apical segments absent, 3rd segment 1.4 times 4th segment, length of 3rd and 4th segments 4.2 and 3.1 times their width, respectively; length of maxillary palp 1.2 times height of head; dorsal length of eye 1.5 times temple; temple roundly narrowed posteriad (fig. 409); POL : ∅ ocellus: OOL = 6: 8: 7; frons rather flat, smooth; vertex remotely punctate, rather flat (fig. 409); face rather flat, densely and coarsely punctate, with some striae dorsally; clypeus rather flat, remotely punctate; apical margin of clypeus thin, not differentiated, convex ventrally (fig. 411); length of malar space 0.4 times basal width of mandible; mandible only slightly twisted apically.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum posteriorly and ventrally rugose, antero-medially with a crenulate groove, and rest of pronotum mainly punctate (fig. 401); epicnemial area mainly smooth; precoxal suture smooth; rest of mesopleuron mainly weakly punctate; metapleural flange rounded apically, large, thick, rugose and not lamelliform (fig. 401); metapleuron coarsely rugose ventrally, and punctulate medially, anteriorly widely impressed; notauli rather narrowly crenulate (fig. 413); mesoscutal lobes punctulate; dorsal surface of propodeum coarsely transversely rugose and medial carina absent; the short posterior part of propodeum well separated from dorsal part (fig. 401), mainly smooth except for some carinae, and with a narrow areola posteriorly (fig. 414).

Wings. — Fore wing: r: 3-SR: SR1 = 12 : 11 : 58; SR1 almost straight (fig. 402); cu-a postfurcal, almost straight; 1-CU1: 2-CU1 = 2 : 26; 2-SR: 3-SR: r-m = 16 : 11 : 9; 2A scarcely sclerotized (fig. 402); area basally of 2A mainly bare (fig. 407). Hind wing: r absent; SC + R1 short, straight, somewhat widened anteriorly (fig. 404); hamuli separated from the mainly absent R1 (fig. 412).

Legs.— Hind coxa weakly punctate, with some striae apically, and ventrally, more coarsely punctate (fig. 410); tarsal claws bifurcate, because of a large sharp

subapical tooth, which is situated at the inner side of the claw, only fore claws somewhat pectinate (fig. 406); length of femur, tibia and basitarsus of hind leg 5.8, 9.9, and 7.0 times their width, respectively; length of spurs of hind tibia 0.6 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 2.9 times its apical width, its surface coarsely rugose (fig. 414); dorsal carinae of 1st tergite present in its basal fifth; 2nd tergite rugose (fig. 414).

Colour. — Brownish-yellow; face, ventral third of temple, and eye margins dorsally, whitish-yellow; head dorsally, antenna basally (except annellus), apex of metasoma, most wing veins, dark brown; middle and hind tarsi (except telotarsi), white; wing membrane hyaline; pterostigma brown.

Holotype in MNHN, Paris: "Madagascar Est, Marojejy, rés. nat. int. XII, Anjanaharibe S., 1600 m, III.1961, P. Soga".

Note. — Because the female is unknown, the inclusion of this species in the subgenus *Homolobus* is only tentative. The other possibility is the subgenus *Oulophus*, but because it does not fit well in there and the subgenus *Oulophus* is unknown from the Afrotropical region, I prefer to include it in the subgenus *Homolobus*. *H. rugosus* is a peculiar species because of the remarkable combination of apomorphous character-states (e.g., the shape of SC+R1, the reduced R1, the separated hamuli, the large ocelli and antescutal depression, and smooth precoxal suture) and of plesiomorphous character-states (e.g., the bifurcate claws, the separated areolated posterior part of propodeum, the thick, non-lamelliform metapleural flange, the presence of the dorsal carinae of the 1st tergite, and the sculptured 2nd tergite).

Homolobus (Homolobus) cingulatus (Granger) comb. nov. (figs. 415—430)

Granger, 1949, Mém. Inst. scient. Madagascar 2A: 378, fig. 382 (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 223.

Lectotype, ♀, length of body and of fore wing both 6.6 mm.

Head. — Remaining antennal segments 29, apical segments absent, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 4.1 and 3.7 times their width, respectively; length of maxillary palp 1.3 times height of head; dorsal length of eye 2.3 times temple; temple directly narrowed posteriad (fig. 429); POL : ∅ ocellus : OOL = 6 : 9 : 8; frons rather flat, with some short crenulae; vertex punctulate, rather flat (fig. 429); face rather flat, punctate, dorsally somewhat rugose; clypeus punctulate, rather flat; apical margin of clypeus thin, not differentiated, convex ventrally (fig. 430); length of malar space 1.1 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum crenulate antero-medially, rugose ventrally and posteriorly, and punctate dorsally (fig. 416); epicnemial area rugose; precoxal suture widely punctate-rugose; rest of mesopleuron finely punctate (fig. 416); metapleural flange large, thick, rugose, narrowly lamelliform apically, rather round apically (fig. 416); metapleuron punctulate medially, rugose ventrally and posteriorly; notauli rather narrowly

crenulate (fig. 421); mesoscutal lobes punctulate; dorsal surface of propodeum almost smooth anteriorly, reticulate-rugose medially and posteriorly areolated, enclosed areas mainly smooth; posterior part of propodeum not separated (fig. 416); medial carina of propodeum absent.

Wings. — Fore wing: r : 3-SR : SR1 = 9 : 15 : 71, SR1 straight; cu-a interstitial in left wing, shortly postfurcal in right wing (fig. 418) and 1-CU1 : 2-CU1 = 1 : 15; 2-SR : 3-SR : r-m = 16 : 15 : 11; 2A shortly sclerotized basally (fig. 418); area basally of 2A mainly bare, except distally (fig. 419). Hind wing: r absent; SC + R1 weakly curved (fig. 425); hamuli at R1.

Legs. — Hind coxa finely rugose dorsally, laterally and ventrally punctate; tarsal claws with small subapical tooth, which is somewhat more developed than in *inopinus* and well visible at 80× (fig. 426), pectinate basally, except inner hind claw (fig. 427); length of femur, tibia and basitarsus of hind leg 6.9, 10.5 and 8.8 times their width, respectively; length of spurs of hind tibia 0.7 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.2 times its apical width, its surface smooth basally and its posterior half rugulose (fig. 428); dorsal carinae of 1st tergite absent; 2nd tergite smooth; length of ovipositor sheath 0.17 times fore wing, slender, and almost as long as apical height of metasoma (fig. 416).

Colour. — Light reddish-brown; palpi (except for 6th segment of maxillary palp), tarsi, apices of tibiae and trochanters partly, hind coxa apically, more or less infuscated; pterostigma and wing veins, brown; metasoma black, except for the 2nd tergite and base of the 3rd tergite, which are white.

Lectotype in MNHN, Paris: "Madagascar, Ankaratra, alt. 1800 [m]", "1/1'40", "Muséum Paris, A. Seyrig", "44" (= antennal segments), "Type". Lectotype herewith selected and labelled accordingly. Paralectotypes examined: 1 ♀ and 8 ♂, of which at least the ♀ belongs to the new species *inopinus*. Additional specimens examined: (2 ♀ and 9 ♂), all from Malagasy (Andranotobaka, 1400 m, Ambatolampy; Ampitameloka, 840 m, Sud Moramanga) (MNHN, RMNH). Variations: Length of fore wing 5.3—6.7 mm; length of 4th segment of labial palp 4.3—5.0 times 3rd segment; length of ovipositor sheath 0.14—0.17 times fore wing; some males have the flagellum dark brown.

Note. *H. cingulatus* as defined in this paper is easily recognizable if females are present, because of the comparatively long and slender ovipositor sheath, combined with the whitish 2nd tergite and rather long malar space. The male of *inopinus* is unknown and may be confused with the males of *cingulatus*, but *cingulatus* may be separated by the somewhat longer 4th segment of the labial palp compared with the 3rd segment (length of 4th segment of labial palp 4.3—5.0 times its 3rd segment in *cingulatus*, and 3.5—4.0 times in *inopinus*).

Homolobus (Homolobus) inopinus spec. nov.
(figs. 431—443)

Holotype, ♀, length of body and of fore wing both 7.1 mm.

Head. — Remaining antennal segments 37, but apical segments absent, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 4.4 and 3.8 times

their width, respectively; length of maxillary palp 1.5 times height of head; dorsal length of eye 2.4 times temple; temple directly narrowed posteriad (fig. 442); POL: ∅ ocellus: OOL = 3 : 5 : 5; frons weakly concave, with some rugae; vertex rather flat, punctulate; face rather flat, weakly punctate; clypeus convex basally, weakly punctate; apical margin of clypeus not differentiated, straight medio-ventrally (fig. 437); length of malar space 1.1 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum crenulate antero-medially, punctulate dorsally, and rugose posteriorly and ventrally (fig. 431); epicnemial area mainly rugose; precoxal suture rather coarsely and widely reticulate-rugose; rest of mesopleuron densely punctulate, more punctate near pleural suture; metapleural flange rather large, rounded and lamelliform apically (fig. 431); metapleuron rugose ventrally, punctulate dorsally; notauli narrowly crenulate anteriorly, widely crenulate posteriorly (fig. 438); mesoscutal lobes finely and densely punctulate; surface of propodeum reticulate-rugose anteriorly, only medially remotely reticulate posteriorly, with a short medial carina anteriorly, its posterior part not separated (fig. 431).

Wings.— Fore wing: r : 3-SR : SR1 = 11 : 16 : 74; SR1 straight; cu-a straight, postfurcal; 1-CU1 : 2-CU1 = 1 : 17; 2-SR : 3-SR : r-m = 18 : 16 : 12; 2A shortly sclerotized basally (fig. 435); area basally of 2A mainly bare (fig. 436). Hind wing: r absent; SC + R1 weakly curved (fig. 434); hamuli at R1.

Legs. — Hind coxa coarsely (but basally rather weakly) punctate; tarsal claws with a minute subapical tooth, scarcely visible at 80 × (figs. 439, 443); length of femur, tibia and basitarsus of hind leg 6.7, 9.7, and 9.2 times their width, respectively; length of inner spur of hind tibia 0.7 times basitarsus.

Metasoma. — Length of 1st tergite 2.9 times its apical width, its surface rather shallowly reticulate-rugose, but medially and basally smooth (fig. 441); dorsal carinae of 1st tergite absent; 2nd tergite smooth; length of ovipositor sheath 0.06 times fore wing, somewhat widened apicad, distinctly shorter than apical height of metasoma (fig. 431).

Colour. — Light reddish-brown; tarsi and tibiae somewhat infuscated; antenna (except scapus, pedicellus, and apex of antenna), palpi, hind trochanters, and pterostigma, more or less dark brown; 1st tergite, 3rd tergite mainly and following posterior part of metasoma, black; basal half of metasoma (except 1st tergite) yellowish-white.

Holotype in MNHN, Paris: "Madagascar, Bekily, Reg. Sud. de l'Ile", "Muséum Paris, IV.38, A. Seyrig", "*Zele cingulatus* Gr., B. Sigwalt". This specimen is also a paralectotype of *cingulatus*; I have selected the other ♀ as lectotype of *cingulatus* because it agrees better with the original description ("tarière aussi longue que le metatarse postérieur"). Paratype: 1 ♀ (RMNH), "La Mandraka, 1250 m, Manjakandria, 30.X.56, A.R."; length of fore wing 5.3, of body 6.1 mm; length of ovipositor sheath 0.09 times fore wing; precoxal suture extensively rugose-punctate; length of 4th segment of labial palp 4.0 times 3rd segment; length of malar space 1.2 times basal width of mandible; antennal segments 46; length of both penultimate segments of antenna 1.9 times their width; propodeum only weakly sculptured.

Homolobus (Homolobus) ethiopicus spec. nov.
(figs. 444—457)

Holotype, ♀, length of body 7.2, of fore wing 6.9 mm.

Head. — Antennal segments 44, but apical segments missing, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 4.4 and 3.6 times their width, respectively; length of maxillary palp 1.4 times height of head; dorsal length of eye 3.5 times temple; temple directly narrowed posteriad (fig. 456); POL : ∅ ocellus : OOL = 6 : 10 : 11; frons weakly concave and somewhat rugose; vertex almost flat, punctulate-coriaceous (fig. 456); face weakly convex, coriaceous, dorsally and medially rugose clypeus remotely punctate, rather convex; apical margin of clypeus thin, weakly differentiated from clypeus, and weakly convex ventrally (fig. 445); length of malar space 0.8 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum densely reticulate-rugose, medio-anteriorly crenulate and dorsally punctulate (fig. 444); epicnemial area rugose-punctate; precoxal suture coarsely punctate-reticulate; rest of mesopleuron punctate; metapleural flange large, narrowly lamelliform and rather sharp apically (fig. 444); metapleuron punctate medially, ventrally reticulate, and dorsally more punctulate; notauli anteriorly narrowly, and posteriorly widely crenulate (fig. 454); mesoscutal lobes densely punctulate; surface of propodeum largely densely reticulate-rugose, anteriorly almost smooth, medial carina absent, and its posterior part not separated (fig. 444).

Wings. — Fore wing: r : 3-SR : SR1 = 6 : 8 : 39; SR1 straight; cu-a almost straight, shortly postfurcal; 1-CU1 : 2-CU1 = 1 : 17; 2-SR : 3-SR : r-m = 10 : 8 : 6, basal half of 2A sclerotized (fig. 446); area basally of 2A bare (fig. 449). Hind wing: r absent; SC + R1 somewhat curved (fig. 448); hamuli at R1.

Legs. — Hind coxa densely coriaceous-rugose dorsally, laterally punctate; tarsal claws with a small subapical tooth, well visible at 80 × (figs. 452, 455), setose; length of femur, tibia and basitarsus of hind leg 6.4, 9.2, and 8.7 times their width, respectively; length of spurs of hind tibia 0.7 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 3.0 times its apical width, its surface rugulose (fig. 457); dorsal carinae of 1st tergite absent; 2nd tergite smooth; length of ovipositor sheath 0.07 times fore wing.

Colour. — Reddish-brown; antenna (but annellus and apical half of antenna more light brown), mandibles, base of palpi, propleuron, pronotum ventrally, face sublaterally, stemmaticum, vertex medially, occiput (except near eyes), temples posteriorly, metasoma (but 1st tergite, except for its apex, more reddish-brown; ventral half of metasoma and sides of 2nd notum, yellowish-brown), tegula medially, pterostigma, wing veins, fore and middle coxae, trochanters, and femora, middle tibia, telotarsi, hind coxa posteriorly, hind trochanters, femur, and tibia, more or less dark brown; palpi except for their bases, yellowish.

Holotype in CNC, Ottawa: "Tanganyika, W. Usambara Mts., 1600 m, Lushoto, II. 1962". Paratypes: (2 ♀ and 1 ♂), 1 ♀ (BM): "E. Cape Prov., Katberg, 4000 ft, 1—12.iii.1933", "S. Africa, R. E. Turner, Brit. Mus., 1933-198"; 1 ♀ (TC): "Mpendle, Natal, XII-3-70, S. Afr., H. & M. Townes"; 1 ♂ (TC, allotype), topotypic with ♀ from Natal. Variation: Length of fore wing 6.2—6.9 mm; length

of malar space 0.8—1.3 times basal width of mandible; length of 1st tergite 2.4—3.0 times its apical width; length of ovipositor sheath 0.07—0.08 times for wing; hind and middle claws of ♂ virtually without subapical tooth (as in *cingulatus*); sometimes only coxae, propleuron (partly), pronotum ventrally and metasoma (except for 1st tergite), dark brown.

Homolobus (Homolobus) discolor (Wesmael) comb. nov. (figs. 169, 170, 458—466, 885—887)

Wesmael, 1835, Nouv. Mém. Acad. Brux. 9: 162 (as *Phylax*).
Snellen van Vollenhoven, 1858, in Herklots: Bouwstoffen Fauna Nederland 2: 282 (*Phylax aestivalis*). **Syn. nov.**
Watanabe, 1969, Proc. ent. Soc. Wash. 71: 319, 320, fig. 3.
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 223.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 230, 231.
Čapek, 1975, Biologia 30(11): 819.
Tobias, 1976, Opr. Fauna SSSR 110: 131, fig. 39:1.

Lectotype, ♀, length of body 6.1, of fore wing 6.8 mm.

Head. — Remaining antennal segments 38, apical segments missing, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 4.0 and 3.6 times their width, respectively; length of maxillary palp 1.7 times height of head; dorsal length of eye 2.4 times temple; temple directly narrowed posteriad (fig. 458); POL : ∅ ocellus : OOL = 6 : 6 : 6; frons almost flat and smooth, with some striae laterally; vertex smooth, weakly convex; face rather flat, coriaceous laterally and superficially transversely rugose (fig. 461); clypeus rather flat, smooth, except for some punctulation; apical margin of clypeus not differentiated, thin, slightly convex ventrally (fig. 461); length of malar space 0.6 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum smooth, except for some medial crenulae and rugae posteriorly (fig. 459); epicnemial area smooth; precoxal suture smooth, mainly absent; metapleural flange medium-sized, lamelliform, round apically (fig. 459); metapleuron almost smooth; notauli indistinctly crenulate (fig. 170); mesoscutal lobes indistinctly punctulate; surface of propodeum mainly smooth, except for some short carinae posteriorly and a short medial carina anteriorly, its posterior part not separated from antero-dorsal part (fig. 459).

Wings. — Fore wing: r : 3-SR : SR1 = 10 : 22 : 91; SR1 almost straight (fig. 460); cu-a weakly inclivous, postfurcal; 1-CU1 : 2-CU1 = 2 : 21; 2-SR : 3-SR : r-m = 23 : 22 : 11; 2A shortly sclerotized basally (fig. 460); area basally of 2A bare. Hind wing: r present; 2A faintly indicated by pigmentation (fig. 460); SC+R1 rather curved (fig. 460); hamuli at R1.

Legs. — Hind coxa smooth; tarsal claws with a small, sharp, subapical tooth (fig. 465), setose; length of femur, tibia, and basitarsus of hind leg 6.9, 10.3, and 9.0 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 1.9 times its apical width, its surface smooth, except for some microsculpture laterally (fig. 466); dorsal carinae of 1st tergite faintly indicated in front of spiracles; 2nd tergite smooth; length of ovipositor sheath 0.10 times fore wing.

Colour. — Dark brown; body more or less yellowish-brown ventrally; mandibles (mainly), palpi, legs (except apical 0.6 of hind tibia), and upper hind corner of side of pronotum, yellow; dorso-apical 0.6 of hind tibia brown.

Lectotype in KBIN, Brussels: "Coll. Wesmael", "1877", "*Phylax discolor* mihi, ♀, dét C. Wesmael", "Type". The type-locality is the surroundings of Brussels. Lectotype herewith selected and labelled accordingly. There are two paralectotypes, ♀, with the same labels as the lectotype. There is a further ♀ in the Wesmael Collection which does not belong to the type-series ("4 Jl. 1852, Rouge-etoitre"). Additional specimens examined (82 ♀, males are unknown) from Finland (Helsinki; Degerö, Hels.), Sweden (Höör, Skåne), Denmark (Klaekket; Mølbaek; Bukke, Skov.; Tandby; Satruphole; Sondby), England (Dorking, Surrey; Box Hill, Surrey), Ireland (Saggart, Co. Du.; Carrowgarry, Co. Sl.; Trawalua, Co. Sl.), Netherlands (Plasmolen, Z.L.; E. bank Wijde Aa, nr. Woubrugge; Wijster; Oisterwijk; Asperen; Naardermeer, at light; Crailo, at light; Asselt, at light; Ede; Flevopolder), West Germany (Wiesen, Spessart; Geierlambach; Reither Alm, 850 m; Mainz; Ellmau, ca. 1050 m; Tegernsee; nr. Reval), East Germany (Thüringen), Austria (Styr., Podčetrtek), Switzerland (Mülenen, 800 m), USSR (Irkutskaja obl., garden), Japan (Kamikochi; Kyoto, Honshu) (RMNH, HC, CNC, TC, ZMH, ZMB, ZSB, UZM, ITZ, EI, ZIL, USNM, WHC). Variation: Length of fore wing 7.2—8.9 mm, antennal segments 43—48; length of 1st tergite 2.1—2.2 times its apical width; length of ovipositor sheath 0.09—0.12 times fore wing; anterior half of vein r of hind wing sometimes absent; cocoon whitish. The only known host of the specimens examined is *Odontopera bidentata* (Clerck), which belongs to the Geometridae (Lepidoptera).

Note. The type of Snellen van Vollenhoven's *aestivalis* is lost (Van Achterberg, 1974a: 23), but as already indicated in the original description it is morphologically close to *discolor*. Knowing the Dutch fauna, and considering the ability of Snellen van Vollenhoven to identify correctly despite a lack of literature, I do not hesitate to synonymize *aestivalis* with *discolor*.

Homolobus (Homolobus) dauricus Shestakov
(figs. 467—480)

Shestakov, 1940, Ark. Zool. 32A: 18.
Watanabe, 1969, Proc. ent. Soc. Wash. 71: 319, 320, figs. 1, 2 (p.p.).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 223.

Holotype, ♀, length of body 7.6, of fore wing 7.4 mm.

Head. — Antennal segments 46, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 3.9 and 3.2 times their width, respectively, length of two penultimate segments 2.0 and 2.4 times their width; length of maxillary palp 1.4

times height of head; dorsal length of eye 2.0 times temple; temple directly narrowed posteriad (fig. 474); POL : ∅ ocellus : OOL = 3 : 7 : 4; frons rather flat and smooth; vertex rather flat, punctulate-coriaceous (fig. 474); face rather flat, laterally coriaceous, dorso-medially punctate-rugose and ventro-medially punctate; clypeus weakly convex, remotely punctate; apical margin of clypeus not well differentiated, thin, almost straight medially (fig. 479); length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum coarsely crenulate medially and posteriorly, and striate ventrally (fig. 467); epicnemial area crenulate; precoxal suture punctulate as rest of mesopleuron, mainly absent; metapleural flange large, lamelliform, wide, and round apically; metapleuron punctulate, but rugose-carinate; notauli coarsely and narrowly crenulate (fig. 473); mesoscutal lobes densely punctulate; surface of propodeum smooth anteriorly, medially coarsely transversely rugose and with a suboval areola and costal carinae present (cf. fig. 352), its posterior part not separated from antero-dorsal part (fig. 467).

Wings. — Fore wing: r : 3-SR : SR1 = 5 : 11 : 40; SR1 slightly curved (fig. 469); cu-a somewhat inclivous, but posteriorly curved basad (fig. 469), postfurcal; 1-CU1 : 2-CU1 = 1 : 17; 2-SR : 3-SR : r-m = 10 : 11 : 6; 2A well-developed and sclerotized basally (fig. 469); area basally of 2A mainly bare. Hind wing: r present; SC + R1 evenly curved (fig. 480); hamuli at R1.

Legs. — Hind coxa punctulate; tarsal claws with a small subapical tooth (figs. 475, 476), indistinctly yellowish pectinate, except inner hind claw; length of femur, tibia, and basitarsus of hind leg 5.9, 10.8, and 8.8 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 1.7 times its apical width, its surface smooth, but posterior half weakly and irregularly rugose (fig. 478); dorsal carinae weakly developed in front of spiracles; 2nd tergite smooth; length of ovipositor sheath 0.39 times fore wing.

Colour. — Dark reddish-brown; pterostigma dark brown; palpi, dorso-apical corner of pronotum, and tegulae whitish-yellow; fore and middle legs, light yellowish; eye margin dorsally, vertex, metapleuron mainly, and hind leg mainly, brownish-red; trochanter yellowish and apical two-thirds of hind tibia dark brown; hind tarsus and spurs, reddish; apical third of antenna light brown.

Holotype in NR, Stockholm: "Vladivostok, Sedanka, Malaise/ 10/8.30", "*Homolobus dauricus* sp. n. typ., det. Shestakov", "402, 77", "Riksmuseum Stockholm". Additional specimens examined: (1 ♀ and 2 ♂, EI) from Japan (Hirakura, Mie Honshu; Hikosan, Kyushu; Sapporo, Hokkaido). Length of fore wing of ♀ 8.4 mm, and length of ovipositor sheath 0.36 times fore wing.

Subgenus **Phylacter** Reinhard

Wesmael, 1835, Nouv. Mém. Acad. Brux. 9: 159 (as *Phylax* nec Dahl, 1823).
Reinhard, 1863, Berl. ent. Z. 7: 248 (nom. nov. for *Phylax* Wesmael).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 221.

Type-species: *Rogas annulicornis* Nees.

Synonym: *Phylax* Wesmael, 1835 nec Dahl, 1823.

Diagnosis. — Length of body 6.0—10.9, of fore wing 6.3—11.5 mm, antennal segments 46—55, its 3rd-6th segments of ♀ without a longitudinal ridge; length of 4th segment of labial palp 2.6—3.1 times 3rd segment; length of maxillary palp 1.5—1.6 times height of head; apical margin of clypeus rather convex, not differentiated from clypeus (figs. 487, 500, 509); length of malar space 0.5—1.0 times basal width of mandible; eyes weakly emarginate (figs. 487, 500); temples slightly roundly narrowed posteriad (figs. 321, 490, 499); length of hind femur 7.1—8.1 times its width; claws with a rather wide subapical tooth (fig. 491), or with a posteriorly sharp ventral lamella (figs. 498, 510); inner hind claw of ♀ convex and setose basally (figs. 491, 502); hind telotarsus of ♀ setose near base of inner hind claw; apices of hind tibial spurs of ♂ sharp and hyaline apically (cf. fig. 317); 1A + 2A of fore wing straight (figs. 485, 496); basal third of SR of hind wing more (fig. 494) or less (fig. 484) sclerotized and curved (fig. 507); r of hind wing absent; SC + R1 distinctly curved (figs. 482, 495, 507); length of 1st tergite 2.6—4.8 times its apical width; length of ovipositor sheath 0.12—0.25 times fore wing; posterior part of propodeum not or slightly separated from antero-dorsal part of propodeum (figs. 481, 492, 503).

Distribution. — The subgenus *Phylacter* is only known with certainty from the Palaearctic region, if the Himalayan area is considered to be an extension of the Palaearctic region. One species has a mainly more northern distribution (*annulicornis*), while the other two species are restricted to the South of the Palaearctic region. I have examined a ♂ from Indonesia (Idjen) which may belong to a species close to *annulicornis*.

Key to the species of the subgenus *Phylacter*

1. Tarsal claws bifurcate, the subapical tooth large and in ♀ truncate apically (figs. 488, 491); length of ovipositor sheath 0.12—0.16 times fore wing (fig. 481); South East Palaearctic . . . . *bifurcatus* spec. nov. (p. 322)
— Tarsal claws with a subapical sharp and tooth-shaped ventral lamella (figs. 498, 510); length of ovipositor sheath 0.17—0.25 times fore wing (figs. 492, 503) 2
2. Vein 2-SC + R of hind wing transverse, longer than wide (fig. 495) or quadrate; base of hind tarsus more yellowish basally than medially, 2nd—4th segment whitish, contrasting with hind tibia; mainly North and Middle Palaearctic . . . . *annulicornis* (Nees) (p. 324)
— Vein 2-SC + R of hind wing vertical, wider than long (fig. 507); hind tarsus equally whitish-yellow, only weakly contrasting with hind tibia; South West Palaearctic . . . . *meridionalis* spec. nov. (p. 326)

Homolobus (Phylacter) bifurcatus spec. nov.
(figs. 285, 286, 481—491)

Holotype, ♀, length of body 9.7, of fore wing 9.6 mm.

Head. — Antennal segments 41, but apical segments missing, 3rd segment 1.3

times 4th segment, length of 3rd and 4th segments 4.1 and 3.2 times their width, respectively; length of maxillary palp 1.5 times height of head; dorsal length of eye 2.2 times temple; POL : ∅ ocellus : OOL = 5 : 5 : 6; frons en vertex almost flat and smooth; face mainly flat and slightly punctulate; clypeus convex and punctulate (fig. 487); length of malar space 0.7 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum dorsally smooth, medially and postero-ventrally crenulate-rugose (fig. 481); epicnemial area weakly rugose; precoxal suture largely crenulate-rugose, posteriorly almost smooth (fig. 481); rest of mesopleuron smooth; metapleural flange large, lamelliform, wide and rounded apically (fig. 481); metapleuron largely smooth, rugose ventrally and crenulate anteriorly; notauli closely crenulate (fig. 286); mesoscutal lobes punctulate; surface of propodeum rugose posteriorly and laterally, antero-medially mainly smooth, with a medium-sized carina; this antero-medial carina is divided posteriorly, enclosing a triangular area, its base formed by a lamelliform transverse carina apically.

Wings. — Fore wing: r : 3-SR : SR1 = 9 : 15 : 52; SR1 curved (fig. 484); cu-a almost straight, postfurcal; 1-CU1: 2-CU1 = 3 : 23; 2-SR : 3-SR : r-m = 12 : 15 : 9; 2A shortly sclerotized basally (fig. 484); area basally of 2A remotely setose (fig. 485). Hind wing: SR rather shortly sclerotized basally (fig. 482); 2-SC+R transverse (fig. 484).

Legs. — Hind coxa punctulate; tarsal claws with a large and truncate subapical tooth (figs. 488, 491), outer claws yellowish pectinate basally, inner claws only setose basally; length of femur, tibia, and basitarsus of hind leg 7.1, 10.7 and 10.4 times their width, respectively; length of spurs of hind tibia 0.6 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 4.8 times its apical width, its surface mainly smooth, laterally somewhat microsculptured (fig. 489); dorsal carinae of 1st tergite present in front of spiracles; length of ovipositor sheath 0.14 times fore wing.

Colour. — Brownish-yellow; stemmaticum and its surroundings, and areola, dark brown; hind tarsus evenly yellowish-white, contrasting with hind tibia; pterostigma light brown.

Holotype in NR, Stockholm: "N.E. Burma, Kambaiti, 2000 m, 21/5.1934, Malaise", "Riksmuseum Stockholm". Paratypes: (4 ♀ and 4 ♂) from Burma (1 ♀ and 2 ♂, topotypic: 1 ♂, 28/5, 34, 7000 ft (allotype, NR); 1 ♀, 13—22.VI,1934, 7000 ft (RMNH); 1 ♂, 8.V.1934, 7000 ft (NR)), India (2 ♂, "United Prov., India, 1949, F. Bianchi" (TC); 1 ♀, "India, H.P., Kalalop, 2138 m, 7.VI.1971, Kamilko, DH 79" (DZD)), and Nepal (2 ♀, "27°58'N, 85°00'E, Nepal, 11100 ft, 7 June 1967, Can. Nepal Exp.", "*Zele* Det. W. R. M. Mason" (CNC)). Variation: Length of fore wing 9.0—11.5 mm; antennal segments 49—54; length of malar space 0.7—1.0 times basal width of mandible; length of ovipositor sheath 0.12—0.16 times fore wing; length of 1st tergite 3.7—4.7 times its apical width; frequently middle of mesoscutal lobes dark brown or blackish; 2-SC+R quadrate or transverse; subapical tooth of tarsal claw of ♂ more sharp apically than in ♀.

Homolobus (Phylacter) annulicornis (Nees) comb. nov.
(figs. 315—318, 492—502)

Nees, 1834, Hym. Ichn. affin. mon. 1: 201 (as *Rogas*).
Haliday, (1835) 1836, Ent. Mag. 3:141, 142 (as *testaceator* (nec Curtis, 1832!)).
Wagner, 1928, Verh. Ver. naturw. Unterh. Hamb. 20: 10.
Watanabe, 1969, Proc. ent. Soc. Wash. 71: 319, 320, 323, fig. 6.
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 226.
Papp, 1970, Israel J. ent. 5: 65 (needs confirmation).
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 230, 231.
Čapek, 1972, Ent. Problémy 10: 133, 136.
Papp, 1973, Acta Mus. Mac. Sc. Nat. 14: 9.
Kabašinskaitė & Jakimavičius, 1973, Acta ent. Lituanica 2: 80, 86.
Jakimavičius, 1976, Tr. AN Lit. SSR B2 (74): 90, 93.
Gauld & Huddleston, 1976, Entomologist's Gaz. 27: 43, fig. 20.
Tobias, 1976, Opr. Fauna SSSR 110: 133, fig. 39: 7—10.

Neotype, ♀, length of body and of fore wing both 9.7 mm.

Head. — Antennal segments 45, but apical segments missing, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segment 3.5 and 3.2 times their width, respectively; length of maxillary palp 1.6 times height of head; dorsal length of eye 1.7 times temple; POL : ∅ ocellus : OOL = 5 : 6 : 5; frons rather flat, with some microstriae laterally (fig. 499); vertex rather flat, smooth; face punctulate-rugulose, rather flat; clypeus rather flat, punctulate (fig. 500); length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum crenulate medially and posteriorly, striate ventrally and almost smooth dorsally (fig. 492); epicnemial area reticulate-rugose; precoxal suture reticulate-rugose, but almost smooth posteriorly (fig. 492); rest of mesopleuron punctulate; metapleural flange large, lamelliform, wide en rounded apically (fig. 492); metapleuron punctulate, with some crenulae ventrally; notauli almost smooth, somewhat crenulate posteriorly (fig. 316); mesoscutal lobes punctulate; surface of propodeum finely rugose, almost smooth anteriorly, medial carina absent, except for a short part anteriorly.

Wings. — Fore wing: r : 3-SR : SR1 = 10 : 14 : 55; SR1 weakly curved (fig. 494); cu-a weakly curved (fig. 494), postfurcal; 1-CU1 : 2-CU1 = 1 : 11; 2-SR : 3-SR : r-m = 13 : 14 : 8; 2A scarcely sclerotized basally (fig. 494); area basally of 2A remotely setose (fig. 496). Hind wing: 2-SC+R transverse; basal third of SR wholly sclerotized (figs. 494, 495).

Legs. — Hind coxa punctulate; tarsal claws with a subapical sharp, tooth-shaped lamella (figs. 498, 502), yellowish pectinate basally, except inner hind claw (fig. 502); length of femur, tibia, and basitarsus of hind leg 8.0, 11.2, and 10.4 times its width, respectively; length of outer spur of hind tibia 0.4 times basitarsus (in a ♀ specimen from Denmark (Klaekket) both spurs 0.5 and 0.6 times basitarsus (fig. 317)).

Metasoma. — Length of 1st tergite 3.5 times its apical width, its surface mainly smooth, but somewhat rugulose laterally (fig. 315); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.18 times fore wing.

Colour. — Brownish-yellow; stemmaticum blackish; hind tarsus (except its base and apex) contrasting with its tibia; subapical antennal segments indistinctly infuscated apically; pterostigma yellowish.

Neotype (♀!) in KBIN, Brussels: "Coll. Wesmael", "1874", "♂ *Phylax* ♀ *annulicornis* N.V. Es., dét. C. Wesmael", "Type". Collected in Belgium, in Charleroi or near Brussels, as stated by Wesmael. Because the type of Nees is lost and Wesmael is the first revisor, I designate here this specimen as the neotype of *Rogas annulicornis* Nees, 1834, the type-species of *Phylacter* Reinhard.

Additional specimens examined: (93 ♀ and 137 ♂) from Sweden (Pål.; Lund; Öland, Gårdby), Denmark (Ordrüp, Lynabg; Thali; Humlebaek; Amager; Hinde; Klaekket, Haas; Vorsö; Moens Fyr, nr. Borre; Moesgaard; Braband; Bukke, Skov.; Aakiaer; Silkehorn; Bogø; Rüs; Satruphlg; Schelde; Sathő; Aarö; Dÿrehavn; Copenhagen; Markskel, 100 m, N. Kohavegård, Østjylland, S. Vejle), West Germany (Steinebach am Wörthsee; Hüll nr. Wolnzack; Gambach, nr. Würzburg, at light, beech wood; Wiesen, Spessart; Mainz; Kiel; Worms, Rosg.; Weisskirchen, Mähren; Goslar; Niederadenau, Eifel; Fahnersche Höhe; Tübingen; Bodensee, Ueberlingen; Eisenberg; Goslar a. H., Grauhöfer Holz; Oelber a. W.; Bärenkopf; Park Allee, Eichst.; Gräfeling, Bayern; Günzburg a. D.; München; Furstwied; Harz, Eikntal; Tegernsee), East Germany (Thüringen, Blankenburg; Brünshäupten; Berlin; Ebersdorf), Austria (Leitha Mts., Donnerskirchen; Wien; Rainberg; Steinbruch, Salzburg; Styria, Pagaška, Slatina, 228 m), Switzerland (Glion, 800 m), Czechoslovakia (nr. Prague), Poland (Gdansk), USSR (Moscow; Kaunas; Vilnius, Jaansali; Azerbaijdzhan SSR, Kalajbugurt, wood), Hungary (Budapest), Ireland (Finglas, Co. Du.; Knather, Bundoran dt., Co. Ed.; Strangford, Co. Do.; Trawalua, Co. Sl.), England (Coomb Wood), Netherlands (Tegelen, De Holtmühle, Zuid-Limburg; Driebergen; Venray; Oosterbeek; Neerijnen, Waardenburg; Asperen; Venlo; Otterlo), France (La Bégude de Mazenc, Drôme), Italy (Garda L., Malcerni, 300 m), Romania (Transsylv. Alps, Cibins. Mts.), China (Manchuria, Maderschan), and Japan (Kamikochi; Kyoto, Honshu) (RMNH, ITZ, HC, CNC, TC, UZM, ZSB, ZMB, IZP, NMV, ZIL, USNM, ZI, WHC, EI, KBIN).

Variation: Length of fore wing 6.3—10.3 mm; antennal segments 48—52; length of 1st tergite 2.9—3.5 times its apical width; length of ovipositor sheath 0.17—0.22 times fore wing; metasoma sometimes infuscated apically; vein 2-SC + R of hind wing transverse or quadrate; cocoon whitish, with a more or less developed white transverse medial band. Known hosts of examined specimens: *Lithophane lamda* (F.), *Enargia ypsillon* (Denis & Schiff.), *Xestia triangulum* (Hufn.), and *Orthosia* spec., all four belonging to the Noctuidae, Lepidoptera.

Note. This species is often named *Zele testaceator* Curtis, 1832 (e.g., Nixon, 1938), but examination of the type, the original description, and the figures given by Curtis revealed its synonymy with *Zele albiditarsus* Curtis, 1832 (formerly placed in *Zemiotes* or *Meteorus*). That the correct name for this species is *annulicornis* was stated in 1918 by Bengtsson. He based his opinion solely on the original description, which is clear enough to show *testaceator* of Curtis is the female sex of *albiditarsus*, of which Curtis described only the male. In the Curtis

Collection under *testaceator*, there are 2 ♀ of *Zele albiditarsus* Curtis (of which one is the type of *testaceator*, see note under *albiditarsus*) and 3 ♂. One male without a label and two males collected after the publication of *testaceator*; these males belong to *annulicornis*, and cannot be types of *testaceator*.

Homolobus (Phylacter) meridionalis spec. nov.
(figs. 321—323, 503—512)

Holotype, ♀, length of body 9.9, of fore wing 10.3 mm.

Head. — Antennal segments 41, but apical segments missing, 3rd segment 1.3 times 4th segment, length of 3rd and 4th segments 4.1 and 3.1 times their width, respectively; POL : ∅ ocellus : OOL = 4 : 6 : 5; length of maxillary palp 1.5 times height of head; dorsal length of eye 2.0 times temple; frons rather flat, largely smooth, with some microsculpture (fig. 321); vertex rather flat, punctulate; face punctulate, somewhat rugulose near antennal sockets, rather flat (fig. 509); clypeus convex, punctulate; length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.5 times its height; side of pronotum smooth dorsally, rugulose-crenulate medially and striate ventrally (fig. 503); epicnemial area reticulate-punctate; precoxal suture largely reticulate-punctate, posteriorly almost smooth (fig. 503); rest of mesopleuron punctulate; metapleural flange large, rather thick, and sharp apically; metapleuron mainly smooth, ventrally rugose; notauli narrowly and indistinctly crenulate (fig. 323); mesoscutal lobes punctulate; anteriorly surface of propodeum mainly smooth, posteriorly coarsely reticulate (fig. 511), without medial carina.

Wings. — Fore wing: r : 3-SR : SR1 = 15 : 30 : 118; SR1 curved (fig. 506); cu-a inclivous, slightly curved posteriorly, postfurcal; 1-CU1 : 2-CU1 = 2 : 25; 2-SR : 3-SR : r-m = 25 : 30 : 17; 2A distinctly sclerotized basally (fig. 506); area basally of 2A sparsely setose (fig. 504). Hind wing: 2-SC+R vertical (fig. 507); basal third wholly sclerotized (fig. 506).

Legs. — Hind coxa punctulate; tarsal claws with an apically sharp, tooth-shaped lamella (figs. 510, 512), indistinctly yellowish pectinate basally, except inner hind claw; length of femur, tibia, and basitarsus of hind leg 8.1, 12.6, and 10.0 times their width, respectively; length of spurs of hind tibia 0.6 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 3.0 times its apical width, its surface largely smooth, laterally with some carinae and striae (fig. 511); dorsal carinae of 1st tergite absent, only behind the spiracles with a dorso-lateral carina; length of ovipositor sheath 0.20 times fore wing.

Colour. — Brownish-yellow; stemmaticum black; hind tarsus, base of hind tibia, fore and middle legs mainly, more or less whitish-yellow; hind tarsus only weakly contrasting with hind tibia.

Holotype in CNC, Ottawa: "15.V.1960, Oued Tisquite, 1650 m, 2 km NO Itrano, N. Marokko, Er. Schmidt". Paratypes: (8 ♀ and 3 ♂) from Spain (1 ♂ (UZM), "Spain, Granada, Sierra Nevada, Alb. Universitaria, 6 May 1966, 2600 m, Lyveb.-Matin-Langem."), Cyprus (1 ♂ (CNC), "24.4.53, Cypern, Pera Pcd.,

Mavromoustakis"; 1 ♀ (TC), "Limasol, Cyprus, 23.12.1946, Mavromoustakis"), and France (1 ♀ (RMNH), "44°06′N, 6°15′E, Digne, 650—750 m, 6-11.VI.1967, J. B. Wolschrijn"; 7 ♀ and 1♂ (ITZ, RMNH), "France, Var., Grimaud, B. J. Lempke & K. Straatman"; collected between 11-19.X.1971). Variation: length of fore wing 7.8—10.0 mm; antennal segments 46—50; length of ovipositor sheath 0.20—0.22 times fore wing; length of 1st tergite 3.0—3.1 times its apical width; propodeum sometimes with an irregular medial carina.

Note. This new species seems to have escaped attention because it occurs in spring (April, May), early summer (beginning of June), late autumn (October), or winter (December), while *annulicornis* is most frequently captured in July and August, and less frequently in May, June, and September, although I saw some exceptional captures of *annulicornis* from April, October and November. *H. meridionalis* seems to replace the closely related *annulicornis* in the Mediterranean Region.

Subgenus **Oulophus** nov.

Etymology: From "οὐ" (Greek for "not") and "λοφος" (Greek for "ridge"), because the antennal ridge of the ♀ is not distinctly developed. Gender: masculine.

Type-species: *Homolobus armatus* spec. nov.

Diagnosis. — Length of body 5.8—9.9, of fore wing 5.4—11.5 mm; antennal segments 40—54, its 3rd—6th segments of ♀ usually without a longitudinal ridge, if exceptionally present (fig. 720), then rather weakly developed; length of 4th segment of labial palp 2.2—7.0 times 3rd segment; length of maxillary palp 1.2—1.9 times height of head; apical margin of clypeus rather convex (fig. 525) or almost straight (fig. 549) medially, not (fig. 525) or distinctly (fig. 550) differentiated from clypeus; length of malar space 0.3—1.3 times basal width of mandible; eyes weakly emarginate (figs. 525, 572, 645, 675); temples directly (fig. 677) or weakly roundly narrowed (fig. 722) posteriad; length of hind femur 5.8—7.6 times its width; claws with a large (fig. 524) or small (fig. 534) subapical tooth, or with a narrow, apically sharp, tooth-shaped lamella ventrally (figs. 522, 570); inner hind claw of ♀ convex or straight and setose basally (figs. 524, 534, 560), exceptionally bare and slightly concave (fig. 571); hind telotarsus of ♀ setose near base of inner hind claw; apices of hind tibial spurs of ♂ sharp and hyaline apically; 1A + 2A of fore wing straight (figs. 515, 591); basal third of SR of hind wing only pigmented, not sclerotized (fig. 516) or sclerotized (figs. 618, 635), straight (fig. 631) or weakly curved (fig. 641); r of hind wing present (figs. 590, 603) or absent (figs. 516, 635); SC + R1 more or less curved (fig. 683 versus figs. 539, 555) or almost straight (figs. 631, 725); length of 1st tergite 1.8—3.9 times its apical width; length of ovipositor sheath 0.07—0.77 times fore wing; posterior part of propodeum distinctly (figs. 513, 527) or not (figs. 541, 564) separated from anterodorsal part of propodeum.

Distribution. — This largest and rather diverse subgenus of *Homolobus* is widespread, but is unknown from the Afrotropical and Australian regions. In total ten out of 16 species occur in the New World, including four species restricted to

the South West Nearctic (Sonoran) area, where they seem to have evolved. In the Palaearctic region (including the Himalayan area) six species occur, one of which is Holarctic in its distribution. In the Oriental region (excluding the Himalayan area) only one species is known.

Key to the species of the subgenus *Oulophus*

1. Malar space comparatively long (figs. 525, 532), its length 1.0—1.3 times basal width of mandible; hind coxae extensively and more or less coarsely rugose (figs. 523, 527); both penultimate segments of antenna of ♀ stout (figs. 518, 531), their length 1.2—1.6 times their width; 1st tergite somewhat narrowed apicad (figs. 526, 537); antero-dorsal part of propodeum distinctly separated from its posterior part; Palaearctic 2
— Malar space comparatively short (figs. 549, 554, 595), its length 0.3—0.8 times basal width of mandible; hind coxae smooth or punctulate, at most somewhat rugose dorsally (figs. 553, 596); both penultimate segments of antenna of ♀ more slender, their length 1.7—2.9 times their width; antero-dorsal part of propodeum variable, but in most species not distinctly separated from its posterior part (figs. 553, 577) 3
2. Subapical tooth of tarsal claws comparatively stout, rather blunt and subequal to the apical tooth, resulting in sub-bifurcate claws (figs. 522, 524); body mainly black; medially propodeum mainly coarsely reticulate; vein r of hind wing absent (fig. 516) or only present as a short remnant (fig. 519); pterostigma dark brown; hind basitarsus basally black or brownish, and at least apical half of basitarsus white; vertex smooth or punctulate (fig. 520) . . . . *carbonator* (Shestakov) (p. 330).
— Subapical tooth of tarsal claws slender, sharp, much shorter than the apical tooth (figs. 531, 536); body yellowish and/or brownish; propodeum, except for the carinae, only indistinctly sculptured (fig. 537); vein r of hind wing present, but anterior half usually indistinctly developed (fig. 539), exceptionally mainly absent; whole hind basitarsus and pterostigma yellowish; vertex coriaceous (fig. 538) . . . . *bohemani* (Bengtsson) (p. 332)
3. Vein r of hind wing present (figs. 543, 555), at least posteriorly present as a brownish pigmented stripe 4
— Vein r completely absent (figs. 618, 635) 9
4. Ovipositor sheath short (figs. 541, 553), 0.08—0.16 times fore wing; mesonotum more or less brownish-yellow 5
— Ovipositor sheath comparatively long (figs. 577, 588, 602), 0.25—0.52 times fore wing; mesonotum mainly black 7
5. Pterostigma and parastigma of ♀ unicolorous, yellowish; hind tarsus whitish-yellow; vein r of hind wing comparatively long and strongly reclivous (figs. 525, 569); vertex smooth (fig. 568) 6
— Pterostigma and parastigma of ♀ bicolorous, yellowish and dark brown; hind tarsus brownish-yellow; vein r of hind wing short and comparatively straight (fig. 540); vertex coriaceous (fig. 550); South Nearctic . . . .

. . . . *bicolor* spec. nov. (p. 333)

6. Precoxal suture with some rugae antero-dorsally (fig. 553); subapical tooth of tarsal claws comparatively slender, claws weakly concave medio-ventrally (fig. 558, 560); vein cu-a of fore wing parallel to 3-CU1 (fig. 555); palpi, fore and middle legs more or less whitish-yellow; costulae of propodeum at least partly developed (fig. 553); Holarctic . . . . *flagitator* (Curtis) (p. 334)

— Precoxal suture smooth (fig. 564); subapical tooth of claws lamelliform, rather wide (figs. 570, 571); claws straight medio-ventrally (fig. 571); vein cu-a of fore wing more inclivous than 3-CU1 (fig. 567); palpi, fore and middle legs, brownish-yellow; costulae of propodeum absent (figs. 564, 661); South Nearctic and Neotropical . . . . *acares* spec. nov. (p. 336)

7. Apical two-thirds of hind tibia dark brown or blackish (fig. 596); vertex smooth (fig. 594); propodeum more or less rugose medially (fig. 588); pterostigma unicolorous, dark brown; surroundings of the veins 1-M and 1-CU1 of fore wing hyaline; Palaearctic 8

— Hind tibia completely brownish-yellow; vertex coriaceous (fig. 578); propodeum smooth, except fore some indistinctly developed sculpture postero-medially (fig. 577); pterostigma bicolorous, basally yellowish and medially dark brown; surroundings of the veins 1-M and 1-CU1 infuscated (fig. 580); Neotropical . . . . *occidentalis* spec. nov. (p. 337)

8. Ovipositor sheath subequal to length of metasoma (fig. 588), its length 0.51—0.52 times fore wing; length of vein 3-SR of fore wing 1.7—2.0 times vein r of fore wing; face blackish; length of malar space 0.6—0.7 times basal width of mandible; East Palaearctic . . . . . . *nipponensis* spec. nov. (p. 338)

— Ovipositor sheath much shorter than metasoma (fig. 602), its length 0.25—0.26 times fore wing; length of vein 3-SR of fore wing 1.0—1.3 times vein r of fore wing; face reddish-brown; length of malar space 0.4—0.5 times basal width of mandible; South Palaearctic . . . . *nepalensis* spec. nov. (p. 340)

9. Basal quarter of vein SR of hind wing equally sclerotized as vein 1-M (figs. 618, 635); area basally of vein 2A of fore wing mainly bare (figs. 619, 636); precoxal suture widely sculptured (figs. 616, 633); Oriental and South Palaearctic 10

— Basal quarter of vein SR of hind wing only pigmented, not sclerotized as vein 1-M (figs. 649, 692); area basally of 2A variable, but if mainly bare, then precoxal suture mainly smooth (figs. 714, 734); New World 11

10. Vein 2-SC + R of hind wing long, transverse (figs. 618, 631); base of vein SR of hind wing straight; tarsal claws with a ventral lamella (fig. 629); antenna, hind tibia and body yellowish; Oriental . . . . *crenulatus* spec. nov. (p. 341)

— Vein 2-SC + R of hind wing short, vertical (figs. 635, 641); base of vein SR of hind wing weakly curved; tarsal claws with a subapical tooth (fig. 638); antenna mainly dark brown, but with a medial white or yellowish ring; body and apical 0.7 of hind tibia mainly brownish-black; South Palaearctic . . . . *annulatus* spec. nov. (p. 342)

11. Vein SC + R1 of hind wing curved (figs. 655, 669, 683); area basally of vein 2A of fore wing sparsely setose (figs. 648, 671); vein cu-a of fore wing antefurcal or

interstitial with vein 1-M, exceptionally postfurcal (figs. 649, 670); precoxal suture extensively sculptured, at least dorsally (figs. 647, 680) 12
— Vein SC + R1 of hind wing straight (figs. 716, 739); area basally of vein 2A of fore wing bare (figs. 719, 738); vein cu-a of fore wing distinctly postfurcal (fig. 716); precoxal suture usually mainly smooth (figs. 714, 734) 15
12. Length of ovipositor sheath 0.08—0.36 times fore wing, comparatively short (figs. 667, 680) or medium-sized (fig. 694); subapical tooth of tarsal claws medium-sized (fig. 678) or rather large (fig. 699); hind tarsus more whitish yellow, more strongly contrasting with the brownish tibia 13
— Length of ovipositor sheath 0.68—0.79 times fore wing, long (figs. 646, 649); subapical tarsal tooth comparatively large (fig. 656); hind tarsus and its tibia almost equally coloured, not or only weakly contrasting; South Nearctic . . . . *armatus* spec. nov. (p. 343)
13. Head and antenna brownish-yellow; base of vein SR of hind wing weakly curved (fig. 682); vein cu-a of fore wing antefurcal (fig. 698) or subinterstitial; propodeum rather coarsely and rather remotely rugose or almost smooth (figs. 680, 694); South Nearctic 14
— Head and basal half of antenna (except both basal segments partly), dark brown; base of vein SR of hind wing almost straight (fig. 669); vein cu-a of fore wing interstitial with 1-M (fig. 670) or postfurcal; propodeum partly finely and densely reticulate-rugose (fig. 667); Neotropical *obscurus* spec. nov. (p. 344)
14. Length of ovipositor sheath 0.12—0.15 times fore wing, comparatively short (fig. 680); length of vein 3-SR of fore wing less than twice vein r of fore wing (fig. 682) . . . . *antefurcalis* spec. nov. (p. 345)
— Length of ovipositor sheath 0.29—0.36 times fore wing, medium-sized (fig. 694); length of vein 3-SR of fore wing more than twice vein r of fore wing (fig. 698) . . . . *mesoxiphius* spec. nov. (p. 346)
15. Length of fore wing of ♀ ca. 1.3 times length of body (compare fig. 716 with fig. 714); inner aspect of 3rd—8th antennal segments with a rather weakly developed ridge (fig. 720); subapical tooth of claws comparatively stout (figs. 723, 734); length of ovipositor sheath ca. 0.07 times fore wing . . . . *macropterus* spec. nov. (p. 347)
— Length of fore wing of ♀ 1.0—1.1 times fore wing (compare fig. 737 with fig. 734); antenna of ♀ without ridge; subapical tooth of claws comparatively slender (fig. 740); length of ovipositor sheath 0.13—0.14 times fore wing . . . . *rectinervis* spec. nov. (p. 348)

Homolobus (Oulophus) carbonator (Shestakov) comb. nov. (figs. 513—526)

Shestakov, 1940, Ark. Zool. 32A: 17 (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 222.

Holotype, ♀, length of body 7.5, of fore wing 6.1 mm.

Head. — Antennal segments 46, 3rd segment 1.4 times 4th segment, without antennal ridge, length of 3rd and 4th segments 2.9 and 2.1 times their width,

respectively, both penultimate segments 1.4 times their width (fig. 518); length of 4th segment of labial palp 4.0 times 3rd segment; length of maxillary palp 1.5 times height of head; dorsal length of eye 2.3 times temple; temple directly narrowed posteriad (fig. 520); POL : ∅ ocellus : OOL = 4 : 5 : 6; frons mainly flat, with some striae near antennal sockets (fig. 520); vertex almost flat and smooth; face weakly convex, punctulate medially, punctate laterally and punctate-striate dorsally; clypeus rather flat, remotely punctulate; apical margin of clypeus weakly convex ventrally, not differentiated (fig. 525); length of malar space 1.3 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum smooth dorsally, coarsely crenulate medially and posteriorly, superficially rugose ventrally (fig. 513); epicnemial area punctate-rugose; precoxal suture rugose dorsally, reticulate-rugose medially and punctate ventrally; rest of mesopleuron punctulate; metapleural flange large, wide, thick, without carina, rounded apically (fig. 513); metapleuron largely reticulate-rugose, more punctate medially and almost smooth dorsally; notauli well impressed, wholly crenulate, anteriorly rather narrowly; mesoscutal lobes punctulate; surface of propodeum largely coarsely rugose-reticulate, anteriorly almost smooth, medial carina present in anterior third, its posterior part well separated from somewhat shorter antero-dorsal part, and with weak tubercles laterally (fig. 513); spiracle of propodeum rather large (fig. 513).

Wings. — Fore wing: r : 3-SR : SR1=6 : 6 : 40; SR1 straight; cu-a straight, postfurcal; 1-CU1=1 : 14; 2-SR : 3-SR : r-m=32 : 24 : 23; 2A shortly sclerotized basally (fig. 516); area basally of 2A sparsely setose (fig. 515). Hind wing: r absent, but remnant present in right wing (fig. 519); 2-SC+R transverse; SC+R1 weakly curved (fig. 519); basal third of SR weakly curved and unsclerotized (fig. 516).

Legs. — Hind coxa coarsely rugose-reticulate (fig. 513); tarsal claws with a rather blunt, large subapical tooth (fig. 522, 524), yellowish and inconspicuously pectinate; length of femur, tibia and basitarsus of hind leg 6.3, 10.3, and 7.6 times their width, respectively; length of spurs of hind tibia 0.7 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 3.1 times its apical width, its surface narrowed posteriad, reticulate-rugose (fig. 526); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.15 times fore wing.

Colour. — Black; mandibles, palpi, antenna, antennal sockets, legs (except coxae, hind femur and tibia (except their bases), and hind tarsus), metasoma ventrally, 2nd tergite laterally (fig. 526), wing venation, and tegulae, brownish; hind tarsus (except the black basal half of basitarsus and brownish telotarsus) white; pterostigma dark brown; wing membrane hyaline.

Holotype in NR, Stockholm: "Vladivostok, Sedanka, Malaise/ 18/7, 30", "*Zele carbonator* sp. n. typ., det. Shestakov", "401, 77", "Riksmuseum Stockholm". Paratype: 1 ♀, topotypic (ZI), not examined. Additionally examined: 2 ♂ (DZD), "N.E. Burma, Kambaiti, 1800 m, 17/6 & 16/6, 1934, Malaise, Riksmuseum Stockholm". Variation: wing membrane somewhat brownish, base of hind tarsus only narrowly brownish; subapical tooth of tarsal claws smaller than in holotype,

still larger than in *bohemani*; vertex punctulate; vein r of hind wing completely absent; length of malar space 1.2 times basal width of mandible.

Homolobus (Oulophus) bohemani (Bengtsson) comb. nov. (figs. 354—357, 527—539, 707)

Bengtsson, 1918, Acta Univ. lund. (2)14(32) : 39, 44, 45 (as *Phylacter*).
Watanabe, 1969, Proc. ent. Soc. Wash. 71: 319, 323 (as *geminator*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 221.

Holotype, ♀, length of body 7.1, of fore wing 7.5 mm.

Head. — Remaining antennal segments 18, apical segments absent, 3rd segment subequal to 4th segment, without ridge, length of 3rd and 4th segments 3.0 and 2.9 times their width, respectively; length of 4th segment of labial palp 7 times 3rd segment; length of maxillary palp 1.4 times height of head; dorsal length of eye 1.8 times temple; temple directly narrowed posteriad, coriaceous (fig. 538); POL : ∅ ocellus : OOL = 9 : 9 : 14; frons flat, striate (fig. 538); vertex rather flat, coriaceous; face weakly convex, transversely and finely striate, especially laterally coriaceous (fig. 532); clypeus convex, punctulate; apical margin of clypeus weakly convex ventrally, thin, well differentiated; length of malar space 1.1 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum largely densely reticulate-rugose, dorsally smooth and crenulate medio-anteriorly (fig. 527); epicnemial area reticulate-rugose; precoxal suture coarsely reticulate-rugose; rest of mesopleuron largely reticulate-rugose, posteriorly almost smooth (fig. 527); metapleural flange large, rather thick lamelliform apically (fig. 527); metapleuron largely rugose-reticulate, antero-dorsally smooth; notauli finely and narrowly crenulate (fig. 535); mesoscutal lobes almost smooth; surface of propodeum coarsely areolated, the area between the carinae irregularly and rather weakly rugose, medial carina anteriorly shortly present; posterior part of propodeum well separated (figs. 527, 537).

Wings. — Fore wing: r : 3-SR : SR = 5 : 11 : 39; SR straight (fig. 529); cu-a mainly straight, apically curved basad, postfurcal (fig. 529); 1-CU1 : 2-CU1 = 1 : 9; 2-SR : 3-SR : r-m = 13 : 11 : 7; 2A absent, except for a faintly pigmented trace; area basally of 2A medially bare, posteriorly somewhat setose (fig. 533). Hind wing: posterior half of r present (fig. 529); 2-SC + R transverse; SC + R1 weakly curved (fig. 539); basal third of SR straight basally and unsclerotized.

Legs. — Hind coxa densely and rather finely reticulate-rugose (fig. 527); tarsal claws with small subapical tooth, slender, sharp, and much shorter than apical tooth (figs. 534, 536), setose basally; length of femur, tibia, and basitarsus of hind leg 6.0, 11.3, and 5.7 times their width, respectively; length of spurs of hind tibia 0.5 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 3.2 times its apical width, its surface coarsely reticulate-rugose, scarcely narrowed apicad (fig. 537); dorsal carinae of 1st tergite present in basal third; basal half of 2nd tergite somewhat pimply; length of ovipositor sheath 0.10 times fore wing.

Colour. — Brownish-yellow; palpi, tegulae, pterostigma, metasoma baso-ventrally, and hind tarsus, light yellowish.

Holotype in NR, Stockholm: "Sm. [=Småland]", "Bhn [=Boheman]", "*Phylacter Bohemani* Bgtn" (handwritten in pencil), "407.77", "Riksmuseum, Stockholm". Additional specimens examined: (11♀ and 14 ♂) from Finland (Perikkala; Länsi-Teisko; Lemland, Flaka; id., Apelholm), Sweden (Ljungby), West Germany (Drensfeld; Niederaudorf, Obbay., 1000 m), Kurile Islands (Uruppu), Nepal (27°58′N, 85°00′E, 11100 ft), and India (Kumaon Hills, Dhakuri, 2612 m; H.P. Dhenkund (or Dainkund), 2743 m; Ahla, H.P., 2286 m; H.P., Kalatop, 2438 m) (CNC, WHC, ZMH, EI, HC, TC, DZD, RMNH).

Variation: length of fore wing 6.3—7.8 mm; antennal segments 43—44; length of both penultimate segments 1.2—2.3 times their width, but in ♀ more stout (fig. 531), 1.2—1.6 times their width; length of malar space 1.0—1.3 times basal width of mandible; length of 1st tergite 3.0—3.9 times its apical width; length of ovipositor sheath 0.10—0.11 times fore wing: vein r of hind wing sometimes complete or only posteriorly weakly developed (fig. 357); sometimes only anterior half of precoxal suture and mesopleuron distinctly rugose; antenna frequently dark brown, except for both basal segments; sometimes hind coxa, 1st tergite, hind femur, and mesosoma mainly, rather dark brown.

Homolobus (Oulophus) bicolor spec. nov.
(figs. 540—552, 706)

Holotype, ♀, length of body 6.0, of fore wing 7.0 mm.

Head. — Antennal segments 40, 3rd segment 1.3 times 4th segment, without ridge, length of 3rd and 4th segments 4.4 and 3.4 times their width, respectively, length of both penultimate segments 1.8 and 2.1 times their width; length of 4th segment of labial palp 3.3 times 3rd segment; length of maxillary palp 1.4 times height of head; dorsal length of eye 2.4 times temple; temple directly narrowed posteriad (fig. 550); POL : ⌀ ocellus : OOL = 7 : 11 : 8; frons slightly concave, mainly smooth; vertex rather flat, coriaceous; face punctulate and indistinctly aciculate, rather flat; clypeus convex, punctulate; apical margin of clypeus thin, straight medially, differentiated (fig. 549); length of malar space 0.6 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum smooth, but medio-anteriorly crenulate, posteriorly weakly rugose, and ventrally somewhat punctulate (fig. 541); epicnemial area smooth; precoxal suture, as rest of mesopleuron, smooth, except for some punctulation; metapleural flange rather large, wide, rounded apically (fig. 541); metapleuron smooth, except for some short carinae ventrally; notauli anteriorly mainly smooth, only apical third crenulate (fig. 548); mesoscutal lobes punctulate; surface of propodeum smooth, except for some rugosity laterally, medial carina and areola absent; posterior part of propodeum not separated from antero-dorsal part (fig. 541).

Wings. — Fore wing: r : 3-SR : SR1 = 8 : 21 : 88; SR1 straight; cu-a inclivous, postfurcal; 1-CU1 : 2-CU1 = 1 : 7; 2-SR : 3-SR : r-m = 23 : 21 : 12; 2A well

developed and sclerotized (fig. 543); area basally of 2A bare (fig. 542). Hind wing: r present, comparatively short and rather straight (fig. 540); 2-SC+R transverse; SC+R1 rather curved (fig. 543); basal third of SR weakly curved and unsclerotized (fig. 540).

Legs. — Hind coxa punctulate; tarsal claws with a rather small subapical tooth, setose basally (figs. 545, 552); length of femur, tibia and basitarsus of hind leg 5.8, 10.7, and 7.8 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 1.8 times its apical width, its surface basally smooth, posterior half rugulose (fig. 551); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.13 times fore wing.

Colour. — Brownish-yellow; palpi, fore and middle legs (except tarsi), ovipositor sheath, tegulae, dorso-posterior corner of pronotum, whitish-yellow; stemmaticum, and veins, dark brown; parastigma and pterostigma bicolorous: base and posterior margin of parastigma and apical 0.6 of pterostigma dark brown, rest of para- and pterostigma yellowish; wing membrane slightly brownish, especially near veins.

Holotype in CNC, Ottawa: "Mex., Chis., 7200 ft, S.Crist. las Casas, 17 June 1969, Malaise trap". Paratypes: (9 ♀), topotypic (CNC, RMNH). Variation: length of fore wing 6.3—7.5 mm; antennal segments 39—43; length of ovipositor sheath 0.14—0.16 times fore wing.

Homolobus (Oulophus) flagitator (Curtis) comb. nov. (figs. 553—563)

Haliday, 1835 (1836), Ent. Mag. 3 : 142 (*as chlorophthalmus* (nec Spinola, 1808, and Nees, 1834)).
Curtis, 1837, Guide Br. Insects: 119 (*Zele flagitator* nom. nov. for *chlorophthalmus* Haliday).
Lyle, 1914, Entomologist 47: 289, 290 (*Zele geminator* nom. nov. for *chlorophthalmus* Haliday).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 224.

Redescribed after a ♀ from Ireland, length of body 7.3, of fore wing 8.3 mm.

Head. — Antennal segments 45, 3rd segment 1.2 times 4th segment, without ridge, length of 3rd and 4th segments 3.8 and 3.2 times their width, respectively, length of both penultimate segments 1.8 and 2.0 times their width; length of 4th segment of labial palp 4.0 times 3rd segment; length of maxillary palp 1.7 times height of head; dorsal length of eye 1.9 times temple; temple directly narrowed posteriad (fig. 556); POL : ∅ ocellus : OOL = 3 : 6 : 5; frons almost flat and smooth; vertex rather flat, almost smooth (fig. 556); face rather flat, densely and finely coriaceous, with a medial tubercle (fig. 554), shiny; clypeus strongly convex, remotely punctate; apical margin of clypeus weakly convex, differentiated (fig. 554); length of malar space 0.7 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum smooth, except for some crenulae medially and some micro-striation posteriorly (fig. 553); epicnemial area almost smooth; precoxal suture smooth, except for some rugae anteriorly (fig. 553); rest of mesopleuron smooth; metapleural flange large, lamelliform, wide and rounded apically; metapleuron smooth, but ventrally

rugose; notauli rather finely crenulate (fig. 562); mesoscutal lobes smooth; surface of propodeum smooth anteriorly, medially and posteriorly superficially rugose, with a rather long medial carina anteriorly, areola weakly developed and costulae present (fig. 553); posterior part of propodeum not separated from antero-dorsal part.

Wings. — Fore wing: r : 3-SR : SR1 = 7 : 12 : 55; SR1 straight; cu-a strongly inclivous, postfurcal, parallel to 3-CU1 (fig. 555); 1-CU1 : 2-CU1 = 1 : 10; 2-SR : 3-SR; r-m = 14 : 12 : 7; 2A absent except for a minute basal remnant (fig. 555); area basally of 2A sparsely setose. Hind wing: r present, comparatively long and reclivous (fig. 555); 2-SC + R transverse; SC + R1 evenly curved; basal third of SR slightly curved and unsclerotized (fig. 555), scarcely posteriorly curved distad of r.

Legs. — Hind coxa weakly punctate-rugose dorsally; tarsal claws with a comparatively slender subapical tooth, medio-ventrally weakly concave (figs. 558, 560), setose basally; length of femur, tibia and basitarsus of hind leg 7.4, 12.8, and 10.0 times their width, respectively; length of spurs of hind tibia 0.5 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 2.8 times its apical width, its surface shallowly rugulose submedially (fig. 563); dorsal carinae present in front of spiracles; length of ovipositor sheath 0.09 times fore wing.

Colour. — Brownish-yellow; stemmaticum and apical half of antenna, dark brown; palpi, fore and middle legs, hind tarsus slightly more whitish-yellow.

Holotype probably lost, not present in the Haliday Collection, Dublin, nor in the Royal Scottish Museum, Edinburgh, nor in the National Museum of Victoria, Melbourne. Redescribed after ♀ from Stelfox Collection, USNM: "45", "Amongst logs!, Drinahilly, Co. Do., A.W.S., 2.11.65", "*geminator* ♀ A.W.S.", "A.W. Stelfox Collection 1966". Because the description of Haliday is sufficient and confusion with another Palaearctic species is unlikely, the designation of a neotype is not necessary. Additional specimens examined: 74 ♀ and 51 ♂. From the Palaearctic region (including the Himalayan area): Sweden (Vmld, Ekshäred), England (Aviemore), Ireland (Hallyfort, Co. Wx.; Alerlow, Co. St.; Drinnahilly, Co. Do.; Tollymore Park, Co. Do.), West Germany (Ober-Harz, Torfhaus, ca. 800 m; Ober-Bayern, Ellmau, ca. 1050 m; Reither Alm, 850 m; Schladwohg, 1250 m), Nepal (Pulchauki, Ktmd, 8000 ft; 28°00′N, 85°00′E, 10500 ft; 27°58′N, 85°00′E, 11100 ft; 27°56′N, 85°00′E, 9900 ft), and India (H.P., Narkanda, 2700 m; Kumaon Hills, Phurkia, 3504 m; Simla Hill, H.P., Narkanda) (ZSB, USNM, HC, CNC, AC, DZD).

From the Nearctic region: Alaska (Spenard; Tsaina R.; Casio Core, Attu, Aleut.), British Columbia (Hixon; Miskatla Inlet; Falkland; Port Renfreu; Galiano Isl.; Coleman Cr.; Klemtu; Cowichan L.; Lagoon Rd.; Sooka; Beechy Head; Cumshavalnld; Alliford Bay; Terrace, airport area; Wellington; Tofino; S. Pender Isl.; Johnson L.; Mt. Arrowsmith; Ootsa; Ocean Falls; Port San Juan; Green Inlet; Metchosin; Gualicum; Murtle R.; S. Gote Y.N.P.; Zeballos R.), Alberta (Smith; Pocohontas; Brule; Hinton), Ontario (Pass Lake; Beardmore; Nakina), Quebec (Sac à l'Ours; Ct. Pope; St. Vianney; Indian House L.; Sapin), New Foundland (South Branch), Colorado (Phantom Vy., RMNP, 9400 ft), New

Hampshire (Pinkham Notch), North Carolina (Devil's Court House, Blue Ridge Parkway; Clingmans Dome, 6600 ft; Mt. Pisgah, 5000—5749 ft; Pisgah Nat. Forest, Haywood Co., Chestnut Bald, 5900 ft; Highlands, Whiteside Mt., 4900 ft, and California (Marin Co., Mill Valley; Arcata, Humboldt Co., black light trap; Lily Pond Alpine Lk., Marin Co., 1500 ft) (CAS, UCA, BM, CNC, TC, RMNH). Variation: length of fore wing 5.4—9.0 mm; antennal segments 45—49; length of 4th segment of labial palp 4.0—4.5 times 3rd segment; length of malar space 0.7—0.8 times basal width of mandible; length of 1st tergite 2.5—2.9 times its apical width; length of ovipositor sheath 0.08—0.10 times fore wing; 3rd segment of antenna of ♀ sometimes with a weakly developed ridge at the inner side; sometimes middle of mesoscutal lobes infuscated. Cocoon rather thin and whitish.

Known hosts of examined specimens all belong to the Geometridae: *Eupithecia longipalpata* Packard, *E. placidata* Packard, *E. unicolor* Hulst, *E. annulata* Hulst, *E. olivaceae* Taylor, *E. harrisonata* MacK., *Nyctobia limitata* (Walker), *N. nigroangulata* Strecker, *Oporinia pulchraria* (Minot), *Melanolophia* spec., *Campaea perlata* (Guenée) on *Betula papyrifera*, id. on *Salix* sp., *Caripeta divisata* Walker, *Entephria caesiata* Lang, and *Alcis repandata* (L.) on *Vaccinium myrtillis* L.

Homolobus (Oulophus) acares spec. nov.
(figs. 564—574, 661—663)

Holotype, ♀, length of body 9.2, of fore wing 10.2 mm.

Head. — Antennal segments 45, 3rd segment 1.3 times 4th segment, without ridge, length of 3rd and 4th segments 4.3 and 3.4 times their width, respectively, length of both penultimate segments 2.3 and 2.4 times their width; length of 4th segment of labial palp 4.0 times 3rd segment; length of maxillary palp 1.7 times height of head; dorsal length of eye 2.6 times temple; rather directly narrowed posteriad (fig. 568); POL : ⌀ ocellus : OOL = 5 : 12 : 9; frons smooth, slightly concave medially; vertex flat, smooth; face rather flat, smooth laterally, indistinctly rugulose-punctate medially (fig. 572); clypeus strongly convex, punctulate; apical margin of clypeus straight medially, thin, differentiated; length of malar space 0.6 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum crenulate medio-anteriorly, rugose posteriorly, ventrally somewhat punctulate, and dorsally smooth (fig. 564); epicnemial area smooth; precoxal suture smooth, rest of mesopleuron punctulate; metapleural flange large, rather thick, wide and rounded apically; metapleuron smooth, except for some ventral carinae; notauli largely smooth, posteriorly somewhat crenulate (fig. 663); mesoscutal lobes indistinctly punctulate; surface of propodeum mainly smooth, except for some rugae (fig. 661), with a short medial carina anteriorly, without costulae and areola; posterior part of propodeum not separated from antero-dorsal part (fig. 564).

Wings. — Fore wing : r : 3-SR : SR1 = 17 : 29 : 110; SR1 weakly curved (fig. 567); cu-a more inclivous than 3-CU1 (fig. 567), somewhat curved basad apically, postfurcal; 1-CU1 : 2-CU1 = 1 : 9; 2-SR : 3-SR : r-m = 28 : 29 : 14; 2A shortly sclerotized basally (fig. 567); area basally of 2A mainly bare (fig. 566). Hind wing: r

present, comparatively long and strongly reclivous (fig. 569); 2-SC + R transverse; SC + R1 rather curved; basal third of SR rather straight, distad of r rather abruptly curved posteriad (fig. 567).

Legs. — Hind coxa punctulate, dorso-apically with some weak striae (fig. 662); tarsal claws with apically sharp, tooth-shaped lamella (fig. 570), somewhat yellowish pectinate basally, but inner hind claw bare and slightly concave basally (fig. 571); length of femur, tibia and basitarsus of hind leg 6.0, 9.6, and 7.8 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.7 times its apical width, its surface smooth anteriorly, posterior half rugulose (fig. 661); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.10 times fore wing.

Colour. — Brownish-yellow; stemmaticum blackish; hind tarsus whitish-yellow; wing membrane somewhat infuscated; wing veins partly dark brown.

Holotype in RMNH, Leiden: "Museum Leiden, N. Panama, Boquete, Alto Lino, 1300 m, 8°48′N-82°26′W, 21.1.1977, H. Wolda, at light". Paratypes: (20 ♀ and 10 ♂), 2 ♂ (CNC, RMNH), "Mex., Dgo., 9000′ (ft), El Salto, 10 mi. W., 2—6 June 1964, W. R. M. Mason"; 1 ♀, id., 16 July 1964 (CNC); 1 ♀ (CNC), 1 July 1964; 1 ♀ and 1 ♂ (allotype), id., 16 July 1964 (CNC, RMNH); 1 ♂, id. 9 July 1964 (RMNH); 1 ♀ (CNC), "Mex., Dgo., 24 mi. W. La Ciudad, 7000′ (ft), 25 July 1964, W. R. M. Mason"; 1 ♂ (CNC), id., 8 Aug. 1964, W. R. M. Mason; 1 ♀ (RMNH), id., 12 Aug. 1964; 1♀ id., 2 July 1964 (CNC); 1 ♀, "Mex., Dgo., 30 mi. W. La Cuidad, 6500′ (ft), 25 July 1964, W. R. M. Mason" (CNC); 1 ♀, "Mex., Dgo., 3 mi. E. El Salto, 8500′ (ft), 10 July 1964, W. R. M. Mason" (RMNH); 1 ♀, id., 4 July 1964 (CNC); 1 ♀, "Ramsey Cyn., 6000′ (ft), 15 mi. S. Sierra Vista, Huachuca Mts., Ariz., Sternitzky, 29.IX.67" (CNC); 3 ♂, id., 29.X.1967 (CNC); 3 ♀, id., 29.X.1967 (CNC); 1 ♀, id., 28.XI.1967 (CNC); 1 ♂, id., 9.IX.1967 (RMNH); 1 ♀, id., 30.IX.1967 (CNC); 1 ♀, id., VII.1968 (CNC); 1 ♀, "Omilteme, Guerrero, 8000 ft, Aug., H.H. Smith", "Godman-Salvin Coll. 1904-1" (BM); 1 ♀, "Jalapa, Ver., Mex., VIII/1-6/61, R. & K. Dreisbach" (MSU); 1 ♀, id., IX/28-X/3/61 (MSU); 1 ♀, "Rustler Park, 8500 (ft), Chiricahua Mts., Ariz., VII-20-72, at light, J. Powell" (UCA); 1 ♀, id., VIII-20-72 (UCA).

Variation: length of fore wing 7.5—10.2 mm; antennal segments 45—48; length of ovipositor sheath 0.08—0.12 times fore wing; inner side of 3rd segment of antenna sometimes with weakly developed ridge; vein SR of hind wing sometimes as in *flagitator*, scarcely curved distad of r. I exclude from the type-series 1 ♂ from Bolivia (Coroico, 1800 m (CNC)), with white hind tarsus and the tarsal lamella less developed than in holotype.

Homolobus (Oulophus) occidentalis spec. nov.
(figs. 575—586)

Holotype, ♀, length of body 5.8, of fore wing 7.1 mm.

Head. — Antennal segments 20, but apical segments missing, 3rd segment 1.3 times 4th segment, without ridge, length of 3rd and 4th antennal segments 4.4 and 3.4 times their width, respectively; length of 4th segment of labial palp 3.8 times

3rd segment; length of maxillary palp 1.4 times height of head; dorsal length of eye 2.0 times temple; directly narrowed posteriad (fig. 578); POL : ∅ ocellus : OOL = 6 : 9 : 12; frons almost flat and smooth, but laterally somewhat rugose; vertex rather flat, coriaceous; face rather flat, coriaceous, but medio-ventral triangle smooth (fig. 585); clypeus convex, punctulate; apical margin of clypeus almost straight medially, thin, differentiated; length of malar space 0.8 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum smooth, but medio-anteriorly shortly crenulate and posteriorly rugose (fig. 577); epicnemial area smooth; precoxal suture absent; mesopleuron slightly punctulate; metapleural flange rather small and rounded apically (fig. 577); metapleuron slightly punctulate; notauli narrowly and indistinctly crenulate (fig. 584); mesoscutal lobes weakly punctulate; surface of propodeum smooth, except for some short rugae medio-posteriorly, without medial carina and areola, and its posterior part not separated from antero-dorsal part.

Wings. — Fore wing: r : 3-SR : SR1 = 10 : 14 : 80; SR1 straight; cu-a postfurcal, inclivous; 1-CU1 : 2-CU1 = 3 : 17; 2-SR : 3-SR : r-m = 19 : 14 : 10; 2A sclerotized basally (fig. 580); area basally of 2A bare (fig. 576). Hind wing: r present (fig. 580); 2-SC + R transverse; SC + R1 curved and rather short (fig. 575); basal third of SR weakly curved, unsclerotized (fig. 580).

Legs. — Hind coxa indistinctly punctulate; tarsal claws with a small subapical tooth (figs. 579, 582), at most somewhat yellowish pectinate basally; length of femur, tibia and basitarsus of hind leg 5.8, 11.4, and 9.4 times their width, respectively; length of spurs of hind tibia 0.5 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 1.8 times its apical width, its surface smooth, but laterally behind spiracles and posteriorly somewhat rugulose (fig. 586); dorsal carinae of 1st tergite shortly developed in front of spiracles; length of ovipositor sheath 0.43 times fore wing.

Colour. — Brownish-yellow; stemmaticum, vertex and frons medially, C + SC + R (except basally), antenna (as far as present, and without annellus), pronotum anteriorly, mesonotum and ovipositor sheath, more or less blackish; face and most wing veins, infuscated; pterostigma medially dark brown; base and apex of pterostigma yellowish; wing membrane hyaline, but near the veins 1-M and 1-CU1 infuscate (fig. 580).

Holotype in TC, Ann Arbor: "Unduavi/Corioco, Yungas La Paz, Bol., 1.2.76, 3000 m, Luis Peña".

Homolobus (Oulophus) nipponensis spec. nov.
(figs. 587—600)

Watanabe, 1969, Proc. ent. Soc. Wash. 71(3): 319, 320, figs. 1, 2 (*Zele daurica* p.p.).

Holotype, ♀, length of body 7.1, of fore wing 7.5 mm.

Head. — Antennal segments 42, 3rd segment 1.2 times 4th segment, without antennal ridge, length of 3rd and 4th segments 3.8 and 3.3 times their width, respectively, length of both penultimate segments 1.7 and 2.1 times their width;

length of 4th segment of labial palp ca. 5 times 3rd segment; maxillary palp incomplete; dorsal length of eye 1.9 times temple; temple directly narrowed posteriad (fig. 594); POL : ∅ ocellus : OOL = 7 : 9 : 12; frons flat, almost smooth; vertex almost flat and smooth; face rather flat, smooth medio-ventrally, dorsally rugose-punctate and coriaceous laterally (fig. 595); clypeus weakly convex, shallowly punctate; apical margin of clypeus weakly convex, rather thick, and not differentiated (fig. 595); length of malar space 0.7 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum aciculate ventrally, crenulate medially and posteriorly, dorsally and submedially smooth (fig. 588); epicnemial area more or less reticulate-rugose; precoxal suture mainly absent, only anteriorly somewhat depressed and with some rugae; rest of mesopleuron remotely punctulate; metapleural flange large, wide and rounded apically (fig. 588); metapleuron reticulate-rugose ventrally, almost smooth dorsally; notauli narrowly crenulate (fig. 599); mesoscutal lobes densely punctulate; surface of propodeum with areola and costulae, its surroundings almost smooth, somewhat rugulose, medial carina absent, except for a short part anteriorly; posterior part of propodeum not separated from antero-dorsal part (fig. 588).

Wings. — Fore wing: r : 3-SR : SR1 = 6 : 12 : 42; SR1 slightly curved (fig. 590); cu-a somewhat inclivous, postfurcal; 1-CU1 : 2-CU1 = 1 : 15; 2-SR : 3-SR : r-m = 11 : 12 : 6; 2A shortly sclerotized basally (fig. 590); area basally of 2A laterally sparsely setose, medially bare (fig. 591). Hind wing: r present, rather long (fig. 590); 2-SC + R transverse; SC + R1 curved, rather short (fig. 592); basal third of SR slightly curved and unsclerotized.

Legs. — Hind coxa remotely punctulate; tarsal claws with a small subapical tooth (figs. 597, 598), setose basally; length of femur, tibia and basitarsus of hind leg 6.6, 10.6, and 8.4 times their width, respectively; length of spurs of hind tibia 0.6 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 2.1 times its apical width, its surface rather superficially rugulose (fig. 600); dorsal carinae of 1st tergite present in basal quarter of tergite; length of ovipositor sheath 0.51 times fore wing, somewhat longer than metasoma (fig. 588).

Colour. — Blackish-brown; patch at vertex near eyes, apico-lateral corner of mesoscutum, and hind leg largely, reddish-brown; apical 0.7 of hind tibia dark brown (fig. 596); palpi, fore and middle legs, tegulae, dorso-apical corner of pronotum, margin of hypopygium, yellowish; pterostigma dark brown; apex of antenna brownish; wing membrane hyaline.

Holotype in EI, Sapporo: "Tsu Mie, Honshu, 9.XII.1962, M. Matsuura", "*Zele daurica* (Shestakov) ♀, Det. C. Watanabe, 1969". Paratypes: (1 ♀ and 2 ♂), 1 ♂ (EI, allotype), "Hirakura, Mie Honshu, 18.XI.1963, M. Matsuura", "*Zele daurica* (Shestakov) ♂, Det. C. Watanabe, 1969", antennal segments 41, length of fore wing 7.1 mm, length of malar space 0.6 times basal width of mandible, and length of 1st tergite 2.0 times its apical width; 1 ♀ (RMNH), "Sapporo, Hokkaido, 27.VIII.1965, M. Miyaz", "*Zele daurica* (Shestakov) ♀, Det. C. Watanabe, 1969", length of fore wing 7.8 mm, length of ovipositor sheath 0.52 times fore wing, length

of maxillary palp 1.5 times height of head, length of malar space 0.6 times basal width of mandible, and length of 2-SR 1.7 times r of fore wing; 1 ♂ (EI), topotypic with allotype, 11.XI.1963. The males of *nipponensis* may be easily confused with males of *dauricus*, but are recognizable by the rugose epicnemial area and more strongly developed propodeal carina of *nipponensis*.

Homolobus (Oulophus) nepalensis spec. nov.
(figs. 601—615)

Holotype, ♀, length of body 6.4, of fore wing 7.0 mm.

Head. — Antennal segments 42, 3rd segment 1.2 times 4th segment, without antennal ridge, length of 3rd and 4th segments 4.0 and 3.4 times their width, respectively, length of both penultimate segments 1.8 and 2.2 times their width; length of 4th segment of labial palp 1.2 times 3rd segment; length of maxillary palp 1.2 times height of head; dorsal length of eye 2.1 times temple; temple directly narrowed posteriad (fig. 608); POL : ∅ ocellus : POL= 3 : 5 : 5; frons almost smooth and shallowly concave; vertex rather flat, smooth; face flat, punctulate, but near antennal sockets punctate-rugose; clypeus convex, punctulate; apical margin of clypeus rather thin, not differentiated, and weakly convex medially (fig. 601); length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum medially and posteriorly crenulate, rest mainly punctulate (fig. 602); epicnemial area punctulate; precoxal suture almost absent, punctulate as rest of mesopleuron; metapleural flange rather large, lamelliform, and rounded apically (fig. 602); metapleuron shallowly punctate, and with some carinae ventrally; notauli narrowly crenulate, but anteriorly almost smooth (fig. 612); mesoscutal lobes almost smooth, somewhat punctulate; surface of propodeum smooth, except for the costulae and a rather irregular medial carina, posteriorly with an irregularly defined, elliptical areola, and posterior part of propodeum not separated from antero-dorsal part (fig. 601).

Wings. — Fore wing: r : 3-SR : SR1= 13 : 13 : 88; SR1 almost straight (fig. 603); cu-a almost straight, narrowly postfurcal; 1-CU1 : 2-CU1= 1 : 15; 2-SR: 3-SR : r-m= 18 : 13 : 8; 2A shortly sclerotized basally (fig. 603); area basally of 2A mainly bare (fig. 606). Hind wing: r present; 2-SC+R transverse; SC+R1 rather curved (fig. 607); basal third of SR almost straight, unsclerotized (fig. 603).

Legs. — Hind coxa punctulate, with some striae dorso-apically; tarsal claws with a medium-sized lamelliform subapical tooth (figs. 613, 614), setose basally; length of femur, tibia and basitarsus of hind leg 6.6, 10.3, and 8.0 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 1.8 times its apical width, its surface indistinctly and remotely rugulose (fig. 615); dorsal carinae of 1st tergite absent, except for a pair of short stubs basally; length of ovipositor sheath 0.26 times fore wing, much shorter than metasoma (fig. 602).

Colour. — Blackish-brown; head, surroundings of eye, temple, antenna (but basal half infuscated), hind trochanters, hind femur, basal third of hind tibia, its

spurs, and hind tarsus, more or less reddish-brown; fore and middle tibiae and tarsi, 1st and 2nd epipleura, brownish-yellow; palpi, fore and middle coxa and femora, dorso-posterior corner of pronotum, tegulae, and base of hind wing, yellowish-white; pterostigma and wing veins, dark brown; hind coxa dark reddish-brown; wing membrane hyaline.

Holotype in CNC, Ottawa: "27°58′N, 85°00′E, Nepal, 11100 ft, 31 May 1967, Can. Nepal Exped.", "*Homolobus*, Det. W.R.M. Mason". Paratype: 1 ♀, topotypic, 7 June 1967 (RMNH), length of fore wing 7.5 mm, length of ovipositor sheath 0.25 times fore wing; length of 3-SR 1.3 times r of fore wing; antennal segments 41, and length of malar space 0.5 times basal width of mandible.

Homolobus (Oulophus) crenulatus spec. nov.
(figs. 616—632)

Holotype, ♀, length of body 9.9, of fore wing 9.6 mm.

Head. — Antennal segments 47, 3rd segment 1.1 times 4th segment, with a rather distinctly developed ridge at the inner side (fig. 628); length of 3rd and 4th segments 4.2 and 3.8 times their width, respectively, length of both penultimate segments 2.3 and 2.6 times their width; length of 4th segment of labial palp 4.6 times 3rd segment; length of maxillary palp 1.5 times height of head; dorsal length of eye 2.6 times temple; temple directl6 narrowed posteriad (fig. 625); POL : ∅ ocellus : OOL = 8 : 11 : 8; frons almost flat and smooth; vertex rather flat, coriaceous, dull; face rather flat, punctulate-coriaceous, rather dull (fig. 620); clypeus rather convex, punctulate; apical margin of clypeus thin, straight medially and not separated (fig. 620); length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum smooth, but medially and posteriorly remotely crenulate (fig. 606); epicnemial area crenulate anteriorly, rugose posteriorly; precoxal suture deeply impressed, anteriorly widely and coarsely crenulate, medially coarsely crenulate-rugose, and posterior third mainly smooth (fig. 606); metapleural flange large, rather slender, lamelliform, narrowly rounded apically (fig. 606); metapleuron punctulate, ventrally with some coarse carinae; notauli anteriorly narrowly and posteriorly widely crenulate (fig. 632); mesoscutal lobes punctulate; surface of propodeum coarsely areolate (fig. 626), enclosed areas mainly smooth, with a medial carina anteriorly and well-developed costulae submedially; posterior part of propodeum not separated from antero-dorsal part (fig. 616).

Wings. — Fore wing: r : 3-SR : SR1 = 22 : 27 : 115; SR1 almost straight (fig. 618); cu-a almost straight, interstitial; 2-SR : 3-SR : r-m = 29 : 27 : 16; 2A shortly sclerotized basally (fig. 618); area basally of 2A bare (fig. 619). Hind wing: r absent; 2-SC + R transverse; SC + R1 rather straight and long (fig. 631); basal third of SR straight and sclerotized (fig. 618).

Legs. — Hind coxa punctulate, but postero-dorsally punctate; tarsal claws with a ventral lamella (figs. 624, 629), setose basally; length of femur, tibia, and basitarsus of hind leg 7.0, 9.9, and 8.1 times their width, respectively; length of

spurs of hind tibia 0.8 and 0.6 times basitarsus.

Metasoma. — Length of 1st tergite 3.1 times its apical width, its surface indistinctly rugulose (fig. 625); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.09 times fore wing.

Colour. — Brownish-yellow; stemmaticum black; hind tarsus somewhat whitish-yellow; wing membrane hyaline.

Holotype in BM, London: "B.N. Borneo, Mt. Kinabalu, Lumu Lumu, 5500 ft, 8:4:1929/ H.M. Pendlebury, coll. F.M.S. Museums", "Ex F.M.S. Museum, B.M. 1955-354".

Homolobus (Oulophus) annulatus spec. nov.
(figs. 633—645, 708)

Holotype, ♀, length of body 8.2, of fore wing 7.7 mm.

Head. — Antennal segments 44, 3rd segment 1.1 times 4th segment, without ridge, length of 3rd and 4th segments 3.7 and 3.3 times their width, respectively, length of both penultimate segments 2.3 and 2.9 times their width; length of 4th segment of labial palp 4.0 times 3rd segment; length of maxillary palp 1.4 times height of head; dorsal length of eye 2.5 times temple; temple directly narrowed posteriad (fig. 639); POL : ∅ ocellus : OOL = 9 : 10 : 10; frons almost smooth, except for some rugae (fig. 639), flat; vertex rather flat and coriaceous; face rather flat, punctate, coriaceous laterally, rugulose medio-dorsally and latero-ventrally (fig. 645); clypeus weakly convex, remotely punctate; apical margin of clypeus thin and straight medially, not differentiated (fig. 645); length of malar space 0.3 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.2 times its height; side of pronotum crenulate medially, rugose ventrally, posteriorly and dorsally mainly smooth (fig. 633); epicnemial area reticulate-rugose; precoxal suture widely reticulate-rugose, except posteriorly (fig. 633); rest of mesopleuron punctulate; metapleural flange lamelliform, large, wide and rounded apically; metapleuron smooth, but posteriorly reticulate-rugose; notauli coarsely crenulate (fig. 642); mesoscutal lobes punctulate; dorsal surface of propodeum mainly smooth laterally, medially and posteriorly with strongly developed carinae, medial carina absent and costulae lamelliform; posterior part of propodeum with an areola, well separated from antero-dorsal part (fig. 633).

Wings. — Forewing: r : 3-SR : SR1 = 8 : 11 : 46; SR1 almost straight (fig. 635); cu-a weakly inclivous, far antefurcal; 2-M + CU1 : 1 + 2CU1 = 3 : 37; 2-SR : 3-SR : r-m = 10 : 11 : 5; 2A shortly sclerotized basally (fig. 635); area basally of 2A bare (fig. 636). Hind wing: r absent; 2-SC + R short, vertical (fig. 635); SC + R1 rather straight (fig. 641); basal third of SR weakly curved and main part sclerotized (fig. 635, 641).

Legs. — Hind coxa punctulate, dorso-anteriorly punctate, and dorso-posteriorly rugose (fig. 633); tarsal claws with a medium-sized, sharp subapical tooth (figs. 638, 643); length of femur, tibia and basitarsus of hind leg 6.1, 9.7 and 7.8 times their width, respectively; length of spurs of hind tibia 0.7 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.2 times its apical width, its surface smooth anteriorly except for some rugae, and posterior half rugose (fig. 644); dorsal carinae of 1st tergite present in basal quarter of tergite; length of ovipositor sheath 0.09 times fore wing.

Colour. — Brownish-black; 13th—19th segments of antenna, base of C+SC+R and hind tarsus (only telotarsus yellowish), white; scapus, pedicellus, and apex of antenna, fore and middle legs, 1st and 2nd tergites, hind coxa, hind femur, ovipositor sheath, tegulae, vertex laterally, palpi, and all trochanters, more or less brownish-yellow; bases of all tibiae and basal half of metasoma, yellowish-white; pterostigma and wing veins, mainly dark brown.

Holotype in DZD, Delhi: "India: H.P., Ahla, 2286 m, 4.viii-16.ix.1971, M.trap, No. tr. I". Paratype: 1 ♂, allotype (DZD), "India, Simla Hill, Sangla, 2743 m, 16.vi.1972, Girish, No. G14". Length of fore wing 7.0 mm, antennal ring yellowish, basal 0.7 of 1st tergite blackish brown, length of body 7.3 mm, antennal segments 45, length of malar space 0.3 times basal width of mandible, length of 1st tergite 1.9 times its apical width, and sculpture and shape of claws as in holotype.

Homolobus (Oulophus) armatus spec. nov.
(figs. 646—660)

Holotype, ♀, length of body 8.9, of fore wing 10.3 mm.

Head. — Antennal segments 48, 3rd segment 1.3 times 4th segment, without ridge, length of 3rd and 4th segments 4.0 and 3.0 times their width, respectively, length of both penultimate segments 2.0 and 1.7 times their width; length of 4th segment of labial palp 2.8 times 3rd segment; length of maxillary palp 1.6 times height of head; dorsal length of eye 1.8 times temple; temple rather directly narrowed posteriad (fig. 653); POL : ∅ ocellus : OOL= 5 : 6 : 5; frons smooth and rather flat; vertex rather flat, almost smooth; face mainly flat, medially weakly convex, indistinctly punctulate, near antennal sockets weakly rugulose (fig. 652); clypeus convex, punctulate; apical margin of clypeus thin, almost straight medially, not differentiated; length of malar space 0.7 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum largely coarsely rugose-striate, dorsally narrowly smooth (fig. 647); epicnemial area anteriorly almost smooth, posteriorly rugose; precoxal suture widely rugose-reticulate; rest of mesopleuron punctulate; metapleural flange large, rounded and rather slender apically (fig. 647); metapleuron punctulate, with some carinae ventrally; notauli narrowly crenulate anteriorly, more widely so posteriorly (fig. 660); mesoscutal lobes indistinctly punctulate; surface of propodeum smooth, except for some rugae and an irregular transverse carina, with a short medial carina, areola absent; posterior part of propodeum somewhat separated from antero-dorsal part (fig. 647).

Wings. — Fore wing: r : 3-SR : SR1= 8 : 16 : 57; SR1 weakly curved (fig. 649); cu-a slightly inclivous, antefurcal; 2-M+CU1 : 1+2-CU1= 1 : 16; 2-SR : 3-SR : r-m= 11 : 16 : 7; 2A distinctly developed and sclerotized (fig. 649); area basally of

2A sparsely setose (fig. 648). Hind wing: r absent; 2-SC+R transverse; SC+R1 weakly curved (fig. 655); basal third of SR weakly pigmented, not sclerotized (fig. 649).

Legs. — Hind coxa punctulate, except for some striae dorso-apically; tarsal claws with a comparatively large subapical tooth (figs. 656, 657); length of femur, tibia and basitarsus of hind leg 6.4, 12.4, and 10.2 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.6 times its apical width, its surface smooth, but posterior half rugulose (fig. 658); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.77 times fore wing.

Colour. — Brownish-yellow; stemmaticum yellowish; hind tarsus not or weakly contrasting with its tibia.

Holotype in CNC, Ottawa: "Capulin Nat. Mon., 6 mi. SW. Folsom, N. Mex., 7300′ (ft), 13.IX.1968, D. F. Hardwick". Paratypes: (25 ♀), 1 ♀, "Carr Cyn., 56—6000′ (ft), 15 mi. S. Sierra Vista, Huachuca Mts., Ariz., Sternitzky, 23.X.67" (CNC); 12 ♀, topotypic with holotype (CNC, RMNH); 5 ♀, "Ute Park, N. Mex., 3 mi. SW., 7300′ (ft), 14.IX.1968, D. F. Hardwick" (CNC, RMNH); 1 ♀, "Ramsey Cyn., 6000′ (ft), 15 mi. S. Sierra Vista, Huachuca Mts., Ariz., Sternitzky, 19.X.67" (CNC); 2 ♀, "Portal, Ariz., 5 mi. SW., 5400′ (ft), 3.X.1969, D. F. Hardwick" (CNC, RMNH); 1 ♀, "Mex., Chis., 9600 ft, Zontehuitz, nr. S. Crist., 25 June 1969, W. R. M. Mason" (CNC); 1 ♀, "Onion Saddle, 7 mi. W. Portal, Ariz., 7600′ (ft), 4.X.1969, D. F. Hardwick" (CNC); 1 ♀, "Ozumbilla, Hidalgo, Mex., 10-30-57, R. & K. Dreisbach" (MSU); 1 ♀, "Arizona: Cochise Co., Southwestern Res. Sta., 5 mi. W. Portal, 30.IX.1966, 5400 ft, P. H. Arnaud, Jr." (CAS). Furthermore I examined 3 ♂ from Ute Park, which probably belong to *armatus*, but are excluded from the type-series because they are not distinguishable with certainty from *antefurcalis* and *mesoxiphius*.

Variation: length of fore wing 8.2—10.3 mm; length of body 7.6—8.9 mm; antennal segments 49—50; length of 4th segment of labial palp 2.2—2.8 times 3rd segment; length of ovipositor sheath 0.68—0.79 times fore wing; length of 1st tergite 2.6—2.7 times its apical width; vein cu-a of fore wing antefurcal, exceptionally interstitial.

Homolobus (Oulophus) obscurus spec. nov.
(figs. 667—679, 703)

Holotype, ♀, length of body 7.4, of fore wing 8.4 mm.

Head. — Antennal segments 53, 3rd segment 1.1 times 4th segment, without ridge, length of 3rd and 4th segments 3.5 and 3.1 times their width, respectively, length of both penultimate segments 2.8 and 3.2 times their width; length of 4th segment of labial palp 3.9 times 3rd segment; length of maxillary palp 1.9 times height of head; dorsal length of eye 4.2 times temple; temple narrowed into a line posteriad (fig. 677); POL : ∅ ocellus : OOL = 7 : 11 : 10; frons medially smooth, laterally rugulose, rather flat; vertex flat, coriaceous; face weakly convex, punctate, weakly transversely rugose dorsally (fig. 675); clypeus weakly convex,

punctate and somewhat coriaceous; apical margin of clypeus thin, almost straight medially, and not differentiated (fig. 675); length of malar space 0.7 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.2 times its height; side of pronotum dorsally punctulate, medially and posteriorly crenulate and ventrally mainly finely rugose (fig. 667); epicnemial more or less rugose; precoxal suture dorsally crenulate, and its anterior half widely rugose (fig. 667); rest of mesopleuron finely punctate; metapleural flange large, lamelliform, wide and rounded apically (fig. 667); metapleuron punctulate, ventrally rugose-reticulate; notauli rather coarsely crenulate (fig. 674); mesoscutal lobes remotely punctulate; surface of propodeum mainly finely and densely reticulate-rugose, only anteriorly and posteriorly partly smooth (fig. 667), with a rather long medial carina anteriorly, and areola absent; posterior part of propodeum not separated from antero-dorsal part (fig. 667).

Wings. — Fore wing: r : 3-SR : SR1= 8 : 13 : 44; SR1 curved (fig. 670); cu-a inclivous, interstitial; 2-SR : 3-SR : r-m= 11 : 13 : 8; 2A basally rather long and slender, sclerotized (fig. 671); area basally of 2A evenly setose. Hind wing: r absent; 2-SC + R transverse; SC + R1 evenly curved (fig. 669); basal third of SR almost straight, unsclerotized (fig. 670).

Legs. — Hind coxa remotely and finely punctate, with some striae dorso-apically (fig. 703); tarsal claws with a well-developed, sharp subapical tooth (figs. 678, 679), setose; length of femur, tibia and basitarsus of hind leg 6.8, 10.5, and 8.8 times their width, respectively; length of spurs of hind tibia 0.8 and 0.6 times basitarsus.

Metasoma. — Length of 1st tergite 3.4 times its apical width, its surface behind the spiracles mainly rugose (fig. 676); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.08 times fore wing.

Colour. — Brownish-yellow; head (except for major part of mandibles), basal half of antenna (except annellus and apex of scapus) and most wing veins, dark brown; hind tarsus (but telotarsus yellowish) and ovipositor sheath, yellowish-white; palpi rather light yellowish; wing membrane slightly yellowish.

Holotype in TC, Ann Arbor: "Nova Teutonia, Santa Catarina, June '53, Braz., Fritz Plaumann". Paratypes: (1 ♀ and 1 ♂) 1 ♂ (allotype, TC), topotypic, IV.30.1948; 1 ♀ (RMNH), topotypic, June 1953. Variation: Length of fore wing 7.4—8.0 mm; antennal segments 53—54; length of 1st tergite 3.4—3.5 times its apical width; vein cu-a of fore wing interstitial or postfurcal, 1-CU1 : 2-CU1= 5 : 53; length of malar space 0.7 times basal width of mandible; metasoma somewhat infuscated in allotype.

Homolobus (Oulophus) antefurcalis spec. nov.
(figs. 664—666, 680—690)

Holotype, ♀, length of body 9.6, of fore wing 10.3 mm.

Head. — Antennal segments 54, 3rd segment 1.2 times 4th segment, without ridge, length of 3rd and 4th segments 3.9 and 3.2 times their width, respectively, length of both penultimate segments 2.0 and 2.3 times their width; length of 4th segment of labial palp 2.3 times 3rd segment; length of maxillary palp 1.6 times

height of head; dorsal length of eye 1.7 times temple; temple roundly narrowed posteriad (fig. 686); POL : ∅ ocellus : OOL = 12 : 12 : 11; frons flat, smooth; vertex mainly flat, smooth; face rather flat, indistinctly rugulose-punctulate; clypeus convex, punctulate; apical margin of clypeus thin, almost straight medially, not differentiated (fig. 687); length of malar space 0.6 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum crenulate medio-anteriorly, ventrally crenulae connected with long rugae, posteriorly rugose, and dorsally smooth (fig. 680); epicnemial area mainly smooth, posteriorly indistinctly rugose; precoxal suture largely reticulate-rugose, posteriorly mainly smooth (fig. 680); metapleural flange lamelliform, large, rounded apically; metapleuron mainly smooth, ventrally with some carinae; notauli narrowly and indistinctly crenulate (fig. 666); mesoscutal lobes indistinctly punctulate; surface of propodeum largely smooth, with several vermiform, irregular and remote carinae, with a long irregular medial carina, without well-developed costulae and areola; posterior part of propodeum not separated from antero-dorsal part (fig. 680).

Wings. — Fore wing: r : 3-SR : SR1 = 17 : 29 : 110; SR1 weakly curved; cu-a inclivous, antefurcal; 2-M + CU1 : 1 + 2-CU1 = 1 : 17; 2-SR : 3-SR : r-m = 25 : 29 : 15; 2A well developed, rather long and sclerotized basally (fig. 682); area basally of 2A sparsely setose (fig. 681). Hind wing: r absent; 2-SC + R transverse; SC + R1 curved (fig. 683); basal third of SR weakly curved and unsclerotized (fig. 682).

Legs. — Hind coxa punctulate, with some weak striae dorso-apically (fig. 664); tarsal claws with a well-developed, subapical, lamelliform tooth (figs. 685, 690), setose; length of femur, tibia and basitarsus of hind leg 7.4, 10.9, and 10.4 times their width, respectively; length of spurs of hind tibia 0.6 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 3.7 times its apical width, its surface smooth, except for some rugulosity laterally (fig. 665); dorsal carinae of 1st tergite absent, except for a short basal remnant; length of ovipositor sheath 0.15 times fore wing.

Colour. — Brownish-yellow; stemmaticum blackish; most wing veins infuscated; hind tarsus whitish-yellow.

Holotype in CNC, Ottawa: "Cimarron Canyon, 7900 ft, Sangre de Cristo Mts., Colfax Co., N.M., July 12, 1962, black light, E. & J. Munroe". Paratypes: (3 ♀), 1 ♀, "Ute park, N. Mex., 3 mi. SW. 7300′ (ft), 14.IX.1968, D. F. Hardwick" (RMNH); 1 ♀, "Mex., Dgo., 8 mi. E. El Salto, 8500′ (ft), 23.VI.1964, W. R. M. Mason" (CNC); 1 ♀, id., 18 July 1964 (CNC). Variation: Length of fore wing 9.9—10.8 mm; antennal segments 54—56; length of vein 3-SR of fore wing 1.6—1.8 times vein r; length of 1st tergite 3.5—3.7 times its apical width; length of ovipositor sheath 0.12—0.15 times fore wing; sometimes surroundings of stemmaticum infuscated.

Homolobus (Oulophus) mesoxiphius spec. nov.
(figs. 691—702, 704, 705)

Holotype, ♀, length of body 8.5, of fore wing 8.9 mm.

Head. — Antennal segments 50, 3rd segment 1.2 times 4th segment, without ridge, length of 3rd and 4th segments 3.6 and 3.1 times their width, respectively,

length of both penultimate segments 1.9 times their width; length of 4th segment of labial palp 2.6 times 3rd segment; length of maxillary palp 1.5 times height of head; dorsal length of eye 2.4 times temple; temple rather roundly narrowed posteriad (fig. 697); POL : ∅ ocellus : OOL = 11 : 11 : 11; frons smooth, slightly concave; vertex flat, smooth; face flat, punctulate, medially and dorsally weakly aciculate (fig. 695); clypeus convex, punctulate; apical margin of clypeus straight medially and well differentiated from clypeus (fig. 695); length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.2 times its height; side of pronotum dorsally smooth; medially coarsely crenulate, ventrally striate-rugose, and posteriorly rugose (fig. 694); epicnemial area almost smooth, somewhat rugose (fig. 694); precoxal suture reticulate-rugose, only posteriorly mainly smooth; rest of mesopleuron punctulate; metapleural flange large, sublamelliform, rather thick, rounded apically; metapleuron smooth, except for ventral and anterior carinae; notauli anteriorly mainly smooth, posterior third crenulate (fig. 704); mesoscutal lobes weakly punctulate; surface of propodeum rather coarsely and remotely reticulate-rugose medially and laterally, in between mainly smooth, medial carina and areola absent; posterior part of propodeum weakly separated from antero-dorsal part of propodeum (fig. 694).

Wings. — Fore wing: r : 3-SR : SR1 = 11 : 32 : 92; SR1 almost straight (fig. 698); cu-a inclivous, antefurcal; 2-M + CU1 : 1 + 2-CU1 = 1 : 14; 2-SR : 3-SR : r-m = 26 : 32 : 14; 2A shortly sclerotized basally (fig. 698); area basally of 2A remotely setose (fig. 693). Hind wing: r absent; 2-SC + R transverse; SC + R1 curved (fig. 692); basal third of SR weakly curved, unsclerotized (fig. 698).

Legs. — Hind coxa punctulate, dorso-anteriorly weakly coriaceous and dorso-posteriorly with some short striae (fig. 705); tarsal claws with a well-developed, lamelliform subapical tooth (figs. 696, 699), indistinctly yellowish pectinate basally, except inner hind claw; length of femur, tibia and basitarsus of hind leg 6.7, 11.8 and 9.0 times their width, respectively; length of spurs of hind tibia 0.6 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 2.8 times its apical width, its surface mainly smooth, posterior third rugulose (fig. 702); dorsal carinae of 1st tergite absent; length of ovipositor sheath 0.34 times fore wing.

Colour. — Brownish-yellow; stemmaticum blackish; hind tarsus (except telotarsus) and ovipositor sheath, whitish-yellow; wing membrane hyaline.

Holotype in CNC, Ottawa: "Ramsey Cyn., 5000′ (ft), 15 mi. S. Sierra Vista, Huachuca Mts., Ariz., Sternitzky, vii.1968". Paratypes: 9 ♀, topotypic, vii.1968 (6), viii.1968 (1), 18.ix.1967 (1), and 29.x.1967 (1) (CNC, RMNH). Variation: Length of fore wing 9.0—10.0 mm; antennal segments 49—52; length of ovipositor sheath 0.29—0.36 times fore wing; length of vein 3-SR of fore wing 2.2—3.7 times vein r; vein cu-a of fore wing antefurcal, but sometimes not distinctly so.

Homolobus (Oulophus) macropterus spec. nov.
(figs. 714—728)

Holotype, ♀, length of body 8.9, of fore wing 11.5 mm.

Head. — Antennal segments 43, 3rd segment 1.1 times 4th segment, with a rather weakly-developed ridge (fig. 720), length of 3rd and 4th segments 4.2 and 4.0 times their width, respectively, length of both penultimate segments 2.6 and 2.7 times their width; length of 4th segment of labial palp 3.9 times 3rd segment; length of maxillary palp 1.7 times height of head; dorsal length of eye 2.0 times temple; temple roundly narrowed posteriad (fig. 722); POL : ∅ ocellus : OOL = 8 : 9 : 16; frons medially somewhat concave, with some striae behind antennal sockets (fig. 722); vertex rather flat and smooth; face mainly flat, medio-dorsally with a tubercle, punctulate, and dorsally somewhat rugulose (fig. 721); clypeus convex, punctulate; apical margin of clypeus almost straight medially, thin, and well differentiated from clypeus; length of malar space 0.8 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum crenulate medio-anteriorly, medially punctulate, and posteriorly crenulate-rugose (fig. 714); epicnemial area punctulate, posteriorly indistinctly rugulose; precoxal suture only anteriorly weakly rugulose, punctulate; rest of mesopleuron punctulate; metapleural flange long, lamelliform, very wide, rounded anteriorly (fig. 714); metapleuron reticulate-rugose ventrally, rest punctulate; notauli indistinctly crenulate anteriorly, more distinctly crenulate posteriorly (fig. 728); mesoscutal lobes punctulate; surface of propodeum smooth, except for some crenulae posteriorly and an interrupted lamelliform lateral carina (fig. 726), medial carina mainly and areola completely absent; posterior part of propodeum not separated from antero-dorsal part (fig. 714).

Wings. — Fore wing: r : 3-SR : SR1 = 6 : 14 : 65; SR1 straight; cu-a inclivous, postfurcal; 1-CU1 : 2-CU1 = 2 : 23; 2-SR : 3-SR : r-m = 17 : 14 : 7; 2A shortly sclerotized basally (fig. 719); area basally of 2A bare. Hind wing: r absent; 2-SC + R transverse; SC + R1 rather straight and long (fig. 725); basal third of SR straight and unsclerotized (fig. 716).

Legs. — Hind coxa punctulate, with some apico-dorsal striae (fig. 727); tarsal claws with a well-developed subapical sharp tooth (figs. 723, 724), yellowish pectinate basally; length of femur, tibia and basitarsus of hind leg 7.6, 12.4, and 10.4 times their width, respectively; length of spurs of hind tibia 0.5 and 0.4 times basitarsus.

Metasoma. — Length of 1st tergite 2.9 times its apical width, its surface smooth (fig. 726); dorsal carinae of 1st tergite mainly absent; length of ovipositor sheath 0.07 times fore wing.

Colour. — Brownish-yellow; stemmaticum blackish; hind tarsus yellowish-white; all tibiae, fore and middle tarsi and tegulae, rather light yellowish.

Type in TC, Ann Arbor: "10 m W. Silvia, Cauca, Colombia, VII.5.(19)70, 10,000' (ft), H. & A. Howden".

Homolobus (Oulophus) rectinervis spec. nov.
(figs. 734—747)

Holotype, ♀, length of body 7.2, of fore wing 7.6 mm.

Head. — Antennal segments 44, 3rd segment 1.1 times 4th segment, without

ridge, length of 3rd and 4th segments 3.8 and 3.6 times their width, respectively, length of both penultimate segments 1.7 and 2.0 times their width; length of 4th segment of labial palp 2.8 times 3rd segment; length of maxillary palp 1.3 times height of head; dorsal length of eye 2.0 times temple; temple rather roundly narrowed posteriad (fig. 741); POL : ∅ ocellus : OOL= 4 : 4 : 5; frons smooth, weakly concave medially; vertex smooth, rather flat; face flat, punctulate laterally, more punctate medially; clypeus convex, punctulate; apical margin of clypeus scarcely differentiated from clypeus, thin, and straight medially (fig. 744); length of malar space 0.8 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum medially crenulate and posteriorly rugose, rest mainly smooth (fig. 734); epicnemial area smooth, except for some punctulation; precoxal suture and rest of mesopleuron punctulate (fig. 734); metapleural flange lamelliform, large, rather rounded apically; notauli narrowly crenulate (fig. 746); mesoscutal lobes mainly smooth; surface of propodeum mainly smooth, medio-anteriorly with an irregular medial carina and medio-posteriorly rugose, without areola; posterior part of propodeum not separated from antero-dorsal part (fig. 734).

Wings. — Fore wing: r : 3-SR : SR1 = 4 : 8 : 45; SR1 weakly sinuate (fig. 737); cu-a almost straight, postfurcal; 1-CU1 : 2-CU1 = 5 : 33; 2-SR : 3-SR : r-m = 12 : 8 : 7; 2A shortly sclerotized basally (fig. 738); area basally of 2A bare. Hind wing: r absent; 2-SC + R transverse; SC + R1 almost straight (fig. 739); basal third of SR almost straight and unsclerotized (fig. 737).

Legs. — Hind coxa rugulose dorso-anteriorly (fig. 745); tarsal claws setose, with a small, slender subapical tooth (figs. 736, 740); length of femur, tibia and basitarsus of hind leg 7.3, 11.5, and 9.6 times their width, respectively; length of spurs of hind tibia 0.4 and 0.5 times basitarsus.

Metasoma. — Length of 1st tergite 2.4 times its apical width, its surface posteriorly remotely and weakly rugose, laterally and basally mainly smooth (fig. 747); dorsal carinae of 1st tergite distinctly developed in basal third of tergite; length of ovipositor sheath 0.14 times fore wing.

Colour. — Brownish-yellow; stemmaticum slightly infuscated.

Holotype in CNC, Ottawa: "Fundo Malcho, Cord. Parral, Chile, L. E. Peña, II.1958". Paratypes: (9 ♀ and 8 ♂), 1 ♀, "Graneros, 1100 m, Prov. O'Higgins, Chile, 4.III.62, L. E. Peña" (RMNH); 1 ♂ (NR), "Ria Aysén (=Aisén, South Chile)", "P. Dusén", "Riksmuseum Stockholm"; 1 ♂ (TC), "Marga Marga River, III.14—15.64, Chile, Luis E. Peña", allotype; 1 ♀, "Bosque de los Conservadores Graneros, 1100 m, O'Higgins, Chile, 1—4.III.62, Peña" (CNC); 1 ♂, "Pichinahuel, Cord., Nahuelbuta, Arauco, Chile, 20—28.I.1959, L. Peña" (CNC); 2 ♂, "El Coigo, Curico, Chile, 1/7.II.1961" (CNC); 1 ♂, id., I.1961 (CNC); 1 ♀, "Chile, Cubillo, C. Curico, Curico, 24/26.I.1961, L. E. Peña" (CNC); 1 ♀, "Pichinahuel, Cord. Nahuelbuta, Arauco, Chile, 10/20.I.1959, L. Peña" (RMNH); 1 ♀, "Tregualemu, Maule-Nuble, Chile, 7.XII.1953, L. Peña" (CNC); 1 ♂, Penalolén, Santiago, Chile, X.1953, L. E. Peña" (RMNH); 1 ♀, "Enco, Chile, Valdivia, 2.III.1955, L. E. Peña" (RMNH); 1 ♀, "Las Nieves, 15.IX.47, Chile, L. E. Peña" (CNC); 1 ♀, "Laguna Amarga, Magallanes, XII.12.60, Chile, T. Cehalovick"

(TC); 1 ♀, "Santiago Prov., Maipa, Chile, XII.28.66, Lionel Stange" (TC); 1 ♂, "Pto. Aqua, L. Traful, Neuquen, Argentina, January 30, 1968, L. & J. Stange", (TC).

Variation: Length of body 6.8—7.8, of fore wing 7.1—8.4 mm; antennal segments 42—44; length of malar space 0.6—0.8 times basal width of mandible; length of fore wing 1.1—1.2 times body; length of ovipositor sheath 0.13—0.14

Key to the Palaearctic species of the genus *Homolobus*

1. Claws simple, without any protuberance (fig. 160); hind tibial spurs of ♂ rounded and pigmented apically, without a sharp, hyaline apex (fig. 112) (subgenus *Apatia*) 2
— Claws with at least a minute subapical tooth (fig. 643) or with a lamella (fig. 629); hind tibial spurs of ♂ sharp and hyaline apically 4
2. Length of outer aspect of 4th segment of labial palp 1.6—2.8 times its medium-sized 3rd segment (fig. 309) 3
— Length of outer aspect of 4th segment of labial palp 4—5 times its tiny 3rd segment (fig. 164) . . . . *truncator* (Say) (p. 285)
3. Frontal aspect of head comparatively transverse (fig. 301), upper condyli of mandibles of ♀ close to lower level of eyes; length of malar space 0.3—0.7 times basal width of mandible; claws distinctly yellowish pectinate basally (fig. 294) . . . . *ophioninus* (Vachal) (p. 298)
— Frontal aspect of head more trapezoid, longer (fig. 311), upper condyli of mandibles of ♀ distinctly below lower level of eyes; length of malar space 0.6—1.1 times basal width of mandible; claws not or weakly pectinate basally (figs. 313, 314) . . . . *truncatoides* spec. nov. (p. 300)
4. Vein 1A + 2A straight (figs. 396, 419) 6
— Vein 1A + 2A curved (fig. 343) (subgenus *Chartolobus*) 5
5. Antennal ridge at inner side of 4th—6th segments straight (fig. 348); vein 2A of fore wing slender compared with its surrounding veins (figs. 343, 353) . . . . *infumator* (Lyle) (p. 305)
— Antennal ridge of 4th—6th segments undulate (fig. 366); vein 2A of fore wing widened basally, if compared with surrounding veins (fig. 369) . . . . *undulatus* spec. nov. (p. 309)
6. Vein SR of hind wing strongly curved and sclerotized basally (fig. 507); area basally of vein 2A of fore wing remotely setose (fig. 496) (subgenus *Phylacter*) 7
— Vein SR of hind wing straight or weakly curved and unsclerotized basally (figs. 539, 649); if, exceptionally, extensively sclerotized, then area basally of vein 2A of fore wing mainly bare (fig. 636) 9
7. Claws bifurcate, subapical tooth large and in ♀ truncate apically (figs. 488, 491); length of ovipositor sheath 0.12—0.14 times fore wing . . . . *bifurcatus* spec. nov. (p. 322)
— Claws with a subapically sharp and tooth-shaped ventral lamella (figs. 498,

510); length of ovipositor sheath 0.17—0.25 times fore wing 8

8. Vein 2-SC + R of hind wing transverse, longer than wide (fig. 495) or quadrate; hind tarsus more yellowish basally than medially, its 2nd—4th segments whitish and contrasting with hind tibia . . . . . *annulicornis* (Nees) (p. 324)

— Vein 2-SC + R of hind wing vertical, wider than long (fig. 507); hind tarsus equally whitish yellow, only weakly contrasting with hind tibia . . . . *meridionalis* spec. nov. (p. 326)

9. Inner aspect of 3rd—6th antennal segments of ♀ with a longitudinal ridge (fig. 468); inner hind claw of ♀ with a concavity ventro-subbasally (fig. 476), not equal to its outer claw (fig. 475) (subgenus *Homolobus*) 10

— Inner aspect of 3rd—6th antennal segments of ♀ without a ridge, or exceptionally with a faintly developed ridge; inner hind claw of ♀ convex or straight ventro-subbasally (fig. 534), (sub)equal to its outer claw (fig. 536) (subgenus *Oulophus*) 12

10. Tarsal claws with a submedial lamella (figs. 390, 392); lamellae of middle and hind claws of ♂ with a 2nd lamella situated at the 1st lamella (figs. 393, 394) . . . . *simplex* (Watanabe) (p. 313)

— Tarsal claws with a subapical tooth (fig. 443); claws of ♂ without lamellae 11

11. Ovipositor sheath short (fig. 459), 0.09—0.12 times fore wing; propodeum without an areola, mainly smooth, except for some rugae (fig. 459); mesopleuron smooth . . . . *discolor* (Wesmael) (p. 319)

— Ovipositor sheath rather long (fig. 467), 0.36—0.39 times fore wing; propodeum with a suboval areola, its surroundings usually rugose (fig. 467); mesopleuron punctulate . . . . *dauricus* Shestakov (p. 320)

12. Malar space comparatively long (figs. 525, 532), its length 1.0—1.3 times basal width of mandible; hind coxa more or less coarsely sculptured (figs. 523, 527); both penultimate segments of antenna of ♀ rather stout, their length 1.2—1.6 times their width (figs. 518, 531) 13

— Malar space comparatively short (figs. 549, 554), its length 0.3—0.8 times basal width of mandible; hind coxa at most punctulate (fig. 553); both penultimate segments of antenna of ♀ more slender (fig. 640), their length 1.7—2.9 times their width 14

13. Subapical tooth of tarsal claws comparatively stout, rather blunt and subequal to its apical tooth, resulting in sub-bifurcate claws (figs. 522, 524); body mainly black; medially propodeum coarsely reticulate; vein r of hind wing absent (fig. 516) or only present as a short remnant (fig. 519); pterostigma dark brown; hind basitarsus black or brownish basally and at least apical half of basitarsus white; vertex smooth or punctulate (fig. 520) . . . . *carbonator* (Shestakov) (p. 330)

— Subapical tooth of tarsal claws slender, sharp, much shorter than the apical tooth (figs. 531, 536); body yellowish and/or brownish; propodeum, except for the carinae, only indistinctly sculptured (fig. 537); vein r of hind wing present, but anterior half usually not distinctly developed (fig. 539), exceptionally mainly absent; whole of hind basitarsus and pterostigma yellowish; vertex coriaceous (fig. 538) . . . . *bohemani* (Bengtsson) (p. 332)

14. Only basal quarter of vein SR of hind wing pigmented, not equal to vein 1r-m (fig. 555); precoxal suture mainly smooth (fig. 553); antenna equally coloured, without a white or yellowish ring; vein r of hind wing present (fig. 607) . . 15
— Basal quarter of vein SR of hind wing equally sclerotized as vein 1r-m of hind wing (fig. 635) precoxal suture extensively sculptured (fig. 633); antenna with a white or yellowish ring medially; vein r of hind wing absent (fig. 635) . . . . *annulatus* spec. nov. (p. 342)
15. Ovipositor sheath rather long (fig. 577), 0.25—0.52 times fore wing; mesonotum mainly black; pterostigma dark brown medially 16
— Ovipositor sheath short (fig. 553), 0.08—0.12 times fore wing; mesonotum mainly yellowish-brown; pterostigma yellowish *flagitator* (Curtis) (p. 334)
16. Length of ovipositor sheath subequal to length of metasoma and 0.51—0.52 times fore wing (fig. 588); length of vein 3-SR of fore wing 1.7—2.0 times vein r; face blackish; length of malar space 0.6—0.7 times basal width of mandible . . . . *nipponensis* spec. nov. (p. 338)
— Length of ovipositor sheath 0.25—0.26 times fore wing and much shorter than metasoma (fig. 602); length of vein 3-SR of fore wing 1.0—1.3 times vein r; face reddish-brown; length of malar space 0.4—0.5 times basal width of mandible . . . . *nepalensis* spec. nov. (p. 340)

Key to the Nearctic species of the genus *Homolobus*

1. Tarsal claws with at least a minute subapical tooth (fig. 545), which is sometimes lamelliform (fig. 350); hind tibial spurs of ♂ sharp and hyaline apically 2
— Tarsal claws simple, without any protuberance (fig. 160); hind tibial spurs of ♂ rounded and pigmented apically (fig. 112) (subgenus *Apatia*) . . . . *truncator* (Say) (p. 285)
2. Vein 1A + 2A of fore wing straight (fig. 542) (subgenus *Oulophus*) 3
— Vein 1A + 2A of fore wing curved (fig. 353) (subgenus *Chartolobus*) . . . . *infumator* (Lyle) (p. 305)
3. Vein r of hind wing present (figs. 543, 555), at least posteriorly, as a brownish pigmented stripe; precoxal suture mainly smooth (figs. 541, 553) 4
— Vein r of hind wing completely absent (fig. 649); precoxal suture extensively sculptured, at least dorsally (fig. 647) 6
4. Pterostigma and parastigma of ♀ bicolorous, yellowish and dark brown; hind tarsus brownish-yellow; vein r of hind wing short and comparatively straight (fig. 540); vertex coriaceous (fig. 550) . . . . *bicolor* spec. nov. (p. 333)
— Pterostigma and parastigma of ♀ unicolorous, yellowish; hind tarsus whitish-yellow; vein r of hind wing comparatively long and strongly reclivous (fig. 555); vertex smooth (fig. 556) 5
5. Precoxal suture with some rugae antero-dorsally (fig. 553); subapical tooth of claws comparatively slender and claw weakly concave ventro-medially (figs. 558, 560); vein cu-a of fore wing parallel to vein 3-CU1 (fig. 555); palpi, fore and middle legs, more or less whitish-yellow; costulae of propodeum at least

partly present (fig. 553) . . . . *flagitator* (Curtis) (p. 334)

— Precoxal suture smooth antero-dorsally (fig. 564); claws with an apical sharp, tooth-shaped ventral lamella and claws straight medio-ventrally (figs. 570, 571); vein cu-a of fore wing more inclivous than vein 3-CU1 (fig. 567); palpi, fore and middle legs, brownish-yellow; costulae of propodeum absent (fig. 661) . . . . *acares* spec. nov. (p. 336)

6. Ovipositor sheath medium-sized (fig. 694) or rather short (fig. 680), 0.12—0.36 times fore wing; subapical tooth of claws medium-sized (fig. 678) or rather large (fig. 699); hind tarsus more whitish-yellow, contrasting with its brownish tibia 7

— Ovipositor sheath long (fig. 646), 0.68—0.79 times fore wing; subapical tooth of claws large (fig. 657); hind tarsus and its tibia almost equally coloured, not or weakly contrasting . . . . *armatus* spec. nov. (p. 343)

7. Ovipositor sheath rather short (fig. 680), 0.12—0.15 times fore wing; length of vein 3-SR of fore wing less than twice length of vein r (fig. 682) . . . . *antefurcalis* spec. nov. (p. 345)

— Ovipositor sheath medium-sized (fig. 694), 0.29—0.36 times fore wing; length of vein 3-SR of fore wing more than twice vein r (fig. 698) . . . . *mesoxiphius* spec. nov. (p. 346)

Key to the Neotropical species of the genus *Homolobus*

1. Tarsal claws with at least a minute subapical tooth (fig. 740), which is sometimes lamelliform (fig. 350); hind tibial spurs of ♂ sharp apically, with a hyaline apex 2

— Tarsal claws simple, without any protuberance (fig. 160); hind tibial spurs of ♂ rounded and pigmented apically (fig. 112) (subgenus *Apatia*) . . . . *truncator* (Say) (p. 285)

2. Vein 1A + 2A of fore wing straight (fig. 738) (subgenus *Oulophus*) 3

— Vein 1A + 2A of fore wing curved (fig. 353) (subgenus *Chartolobus*) . . . . *infumator* (Lyle) (p. 305)

3. Vein r of hind wing present (fig. 567), at least posteriorly, as a brownish pigmented stripe 4

— Vein r of hind wing completely absent (fig. 670) 5

4. Ovipositor sheath short (fig. 564), 0.08—0.10 times fore wing; pterostigma unicolorous, yellowish; vertex smooth (fig. 568) . . *acares* spec. nov. (p. 336)

— Ovipositor sheath medium-sized (fig. 577), ca. 0.43 times fore wing; pterostigma bicolorous, medially dark brown, basally and apically yellowish; vertex coriaceous (fig. 578) . . . . *occidentalis* spec. nov. (p. 337)

5. Vein SC + R1 of hind wing curved (fig. 669); area basally of vein 2A of fore wing sparsely setose (fig. 671); precoxal suture extensively sculptured anteriorly (fig. 667); head and antenna dark brown . . . . *obscurus* spec. nov. (p. 344)

— Vein SC + R1 of hind wing straight (fig. 725); area basally of vein 2A of fore wing bare (fig. 719); precoxal suture usually mainly smooth (fig. 714) 6

6. Length of fore wing of ♀ ca. 1.3 times length of body (compare fig. 716 with fig. 714); inner aspect of 3rd—8th antennal segments with a rather weakly developed ridge (fig. 720); subapical tooth of claws larger, comparatively stout (fig. 723); length of ovipositor sheath ca. 0.07 times fore wing . . . . *macropterus* spec. nov. (p. 347)
— Length of fore wing of ♀ 1.0—1.1 times length of body (compare fig. 737 with fig. 734); inner aspect of 3rd—8th antennal segments without ridge; subapical tooth of claws comparatively small and slender (fig. 740); length of ovipositor sheath 0.13—0.14 times fore wing . . . . *rectinervis* spec. nov. (p. 348)

Key to the Afrotropical species of the genus *Homolobus*

1. Hind claws of ♀ with at least a minute sharp subapical tooth (figs. 426, 443) sometimes claws bifurcate (fig. 406); inner aspect of 3rd—6th antennal segments of ♀ with a ridge (fig. 424); inner hind claw of ♀ weakly concave ventro-subbasally (figs. 427, 439), not the same shape as outer hind claw (figs. 426, 443) (subgenus *Homolobus*) 2
— Hind claws of ♀ simple, without a sharp subapical tooth (fig. 252), at most with a blunt scarcely visible, subapical prominence (figs. 153, 237); inner aspect of 3rd—6th antennal segments of ♀ without a ridge; inner hind claw of ♀ convex or straight ventro-subbasally (fig. 314), of the same shape as outer claw (fig. 313) (subgenus *Apatia*) 5
2. Claws bifurcate (fig. 406); 2nd tergite rugose (fig. 404); vertex punctate (fig. 409); vein SC + R1 of hind wing short, R1 mainly absent, and hamuli separated from R1 (fig. 412) . . . . *rugosus* spec. nov. (p. 314)
— Claws with a small subapical tooth (fig. 426); 2nd tergite smooth (fig. 428); vertex at most punctulate (fig. 429); vein SC + R1 of hind wing longer, R1 shortly developed, and hamuli situated at R1 (fig. 425) 3
3. Second tergite whitish; subapical tooth of tarsal claws of ♀ scarcely visible at 80 × (fig. 443) or, if easily visible, then length of ovipositor sheath 0.14—0.17 times fore wing 4
— Second tergite dark brown and partly reddish or yellowish-brown; subapical tooth of tarsal claws of ♀ easily visible at 80 × (figs. 452, 455); length of ovipositor sheath 0.07—0.08 times fore wing *ethiopicus* spec. nov. (p. 318)
4. Length of ovipositor sheath 0.14—0.17 times fore wing, about as long as apical height of metasoma, slender as ovipositor (fig. 416); subapical tooth of tarsal claws of ♀ small, but easily visible at 80 × (figs. 426, 427) . . . . *cingulatus* (Granger) (p. 315)
— Length of ovipositor sheath 0.06—0.09 times fore wing, distinctly shorter than apical height of metasoma, rather stout as ovipositor (fig. 431); subapical tooth of tarsal claws of ♀ minute and scarcely visible at 80 × (figs. 439, 443) . . . . *inopinus* spec. nov. (p. 316)
5. First tergite of metasoma black, strongly contrasting with the (at least in part, laterally) whitish 2nd and 3rd tergites; vein SR1 of fore wing straight (fig. 147);

precoxal suture mainly smooth (fig. 144) . . . . . *albipalpis* (Granger) (p. 283)
— Three basal tergites of metasoma brownish-yellow, if more or less dark brown, then 2nd tergite yellowish, dark brown or blackish and less contrasting with 1ste tergite; vein SR1 of fore wing more or less curved (figs. 184, 196), if straight (figs. 206, 219), then precoxal suture extensively sculptured (figs. 204, 216) 6
6. Length of outer aspect of 4th segment of labial palp 3.0—5.0 times the small 3rd segment (figs. 200, 222, 235), if intermediate, then vein cu-a of fore wing antefurcal (fig. 206) and/or apical half of metasoma mainly dark brown or blackish 7
— Length of outer aspect of 4th segment of labial palp 1.6—2.8 times the medium-sized 3rd segment (figs. 246, 257, 265); vein cu-a of fore wing more or less postfurcal (figs. 266, 329); metasoma mainly yellowish apically 10
7. Tarsal claws of ♀ with a tiny prominence subapically (figs. 212, 225); veins SR1 of fore wing and SR of hind wing straight or nearly so (figs. 206, 234) . 8
— Tarsal claws of ♀ without any prominence (figs. 202, 203); vein SR1 of fore wing curved (fig. 196) vein SR of hind wing sinuate (fig. 196) . . . . *rufithorax* (Granger) (p. 289)
8. Length of malar space 1.2—1.6 times basal width of mandible (fig. 210); apical half of metasoma blackish or dark brown . . . *maculatus* spec. nov. (p. 291)
— Length of malar space 0.7—1.0 times basal width of mandible (figs. 229, 238), if intermediate, then apical half of metasoma yellowish 9
9. Vein r of fore wing longer than 3-SR (fig. 219); subapical prominence of claws of ♀ very small, scarcely visible at 80× (figs. 225, 226); head, antenna and hind leg, mainly dark brown; palpi, tegulae, fore and middle coxae, yellowish white . . . . *alternipes* spec. nov. (p. 292)
— Vein r of fore wing shorter than 3-SR (fig. 234), exceptionally of equal length; subapical prominence of claws of ♀ small, but at 80× easily visible (fig. 237); head, antenna, hind leg, palpi, tegulae, fore and middle coxae, brownish yellow . . . . *priapus* (Nixon) (p. 293)
10. Vein SR of hind wing strongly sinuate (figs. 243, 258); marginal cell of hind wing distinctly narrowed medially, in respect to its basal width (figs. 254); middle lobe of mesoscutum finely and densely punctate or punctulate (figs. 250, 262); scapus more or less dark brown; vein SC+R1 of hind wing comparatively short (figs. 254, 259) 11
— Vein SR of hind wing weakly sinuate (fig. 266); marginal cell of hind wing not or weakly constricted medially, in respect to its basal width (fig. 290); middle lobe of mesoscutum smooth or weakly punctulate (fig. 300); scapus mainly yellowish; vein SC + R1 of hind wing somewhat longer (figs. 267, 307) . . 12
11. Marginal cell of hind wing constricted just after middle of the cell (fig. 243); length of ovipositor sheath 0.24—0.26 times fore wing, the exserted ovipositor longer than 1.5 times length of 1st tergite (fig. 240); propodeum and 1st tergite irregularly sculptured (figs. 240, 253) . . . . . . *lacteiceps* spec. nov. (p. 294)
— Marginal cell of hind wing constricted in front of middle of the cell (fig. 258); length of ovipositor sheath ca. 0.14 times fore wing, the exserted ovipositor

slightly longer than 1st tergite (fig. 280); propodeum and 1st tergite evenly, finely and densely rugulose (figs. 142, 255) . . . *pulchricornis* (Nixon) (p. 296)

12. Vein 2-SC + R of hind wing transverse, longer than wide (fig. 290); length of hind femur 5.6—7.2 times its maximum width, usually comparatively slender (fig. 291), if intermediate, then upper condyli of mandibles rather far below lower level of eyes or 1st tergite more slender, longer than 2.2 times its apical width (fig. 311); lateral aspect of hind tibial spurs of ♂ more or less truncate apically (figs. 296, 297) 13
— Vein 2-SC + R of hind wing vertical or quadrate (fig. 267); length of hind femur 4.6-5.8 times its maximum width, comparatively stout (fig. 269); upper condyli of mandibles comparatively close to lower level of eyes (fig. 270); 1st tergite stout, its length 1.7—2.2 times its apical width (fig. 271); lateral aspect of hind tibial spurs of ♂ sharp apically (figs. 272, 273) *huddlestoni* spec. nov. (p. 297)
13. Frontal aspect of head comparatively long, trapezoidal (figs. 311, 330); upper condyli of mandibles of ♀ distinctly below lower level of eyes (figs. 311, 330); length of malar space 0.8—1.1 times basal width of mandible, if exceptionally shorter, then claws setose basally (figs. 313, 314) 14
— Frontal aspect of head comparatively short, transverse (fig. 301); upper condyli of mandibles of ♀ close to lower level of eyes (fig. 301); length of malar space 0.3—0.7 times basal width of mandible; claws yellowish pectinate basally (fig. 294) . . . . *ophioninus* (Vachal) (p. 298)
14. Vein SC + R1 of hind wing somewhat curved and shorter (figs. 306, 307); marginal cell of hind wing usually less widened apicad, its apical width 1.9—2.2 times its maximum basal width (fig. 306); length of fore wing 3.5—7.1 mm; claws only setose or indistinctly pectinate basally (figs. 313, 314); ovipositor sheath in undistorted position rather wide apically (fig. 303) . . . . *truncatoides* spec. nov. (p. 300)
— Vein SC + R1 of hind wing almost straight and somewhat longer (figs. 329, 337); marginal cell of hind wing more widened apicad, its apical width 2.4—2.6 times its maximum basal width (fig. 329); length of fore wing 7.0—9.5 mm; claws distinctly pectinate basally (figs. 339, 340); ovipositor sheath slightly more slender (fig. 335) . . . . *pallidistigmus* (Cameron) (p. 303)

Key to the Oriental and Australian species of the genus *Homolobus* (Himalayan area included)

1. Claws simple, without any protuberance (fig. 295); hind tibial spurs of ♂ often rounded and pigmented apically (fig. 112) (subgenus *Apatia*) 2
— Claws with at least a minute subapical tooth (fig. 638) or with a lamella (fig. 624); hind tibial spurs of ♂ always sharp and hyaline apically 6
2. Vein r of hind wing absent (fig. 130); hind tibial spurs of ♂ rounded and pigmented apically (fig. 112) 3
— Vein r of hind wing present (fig. 122); hind tibial spurs of ♂ sharp and hyaline apically . . . . *elagabalus* (Nixon) (p. 280)
3. First tergite of metasoma black, strongly contrasting with the laterally whitish

2nd and 3rd tergite; anteriorly precoxal suture mainly smooth (fig. 128) . . . . *australiensis* (Nixon) (p. 282)

— Basal three tergites of metasoma equally brownish-yellow; anteriorly precoxal suture extensively sculptured (figs. 287, 302) 4

4. Length of outer aspect of 4th segment of labial palp 4—5 times its tiny 3rd segment (fig. 164) . . . . *truncator* (Say) (p. 285)

— Length of outer aspect of 4th segment of labial palp 1.6—2.8 times its medium-sized 3rd segment (fig. 309) 5

5. Frontal aspect of head comparatively transverse (fig. 301); upper condyli of mandibles of ♀ close to lower level of eyes; length of malar space 0.3—0.7 times basal width of mandible; claws yellowish pectinate basally (figs. 294, 295) . . . . *ophioninus* (Vachal) (p. 298)

— Frontal aspect of head comparatively long (fig. 311); upper condyli of mandibles of ♀ distinctly below lower level of eyes (fig. 311); length of malar space of ♀ 0.6—1.1 times basal width of mandible; claws not or weakly pectinate basally (figs. 313, 314) . . . . *truncatoides* spec. nov. (p. 300)

6. Vein 1A+2A of fore wing curved (figs. 353, 369, 380) (subgenus *Chartolobus*) 7

— Vein 1A+2A of fore wing straight (fig. 619) 9

7. Vein 2A of fore wing widened, if compared with its surrounding veins (figs. 369, 380) 8

— Vein 2A of fore wing slender, if compared with its surrounding veins (fig. 353) . . . . *infumator* (Lyle) (p. 305)

8. Basal third of vein SR of hind wing weakly curved (figs. 367, 368); pterostigma light brownish or yellowish brown; hind tarsus yellowish or whitish . . . . *undulatus* spec. nov. (p. 309)

— Basal third of vein SR of hind wing almost straight (fig. 382); pterostigma and hind tarsus blackish . . . . *nigritarsis* spec. nov. (p. 310)

9. Vein SR of hind wing strongly curved and extensively sclerotized basally (fig. 484); area basally of vein 2A of fore wing remotely setose (fig. 485); claws bifurcate, the subapical tooth large and in ♀ truncate apically (figs. 488, 491) (subgenus *Phylacter*) . . . . *bifurcatus* spec. nov. (p. 322)

— Vein SR of hind wing straight or weakly curved, usually only pigmented basally, if exceptionally extensively sclerotized, then area basally of vein 2A of fore wing mainly bare (fig. 619); claws with lamella (fig. 624) or with a sharp medium-sized or small subapical tooth (fig. 534) (subgenus *Oulophus*) . . 10

10. Frontal aspect of head comparatively long (figs. 525, 535); length of malar space 1.0—1.3 times basal width of mandible; hind coxa more or less coarsely sculptured (figs. 513, 527); length of both penultimate segments 1.2—1.6 times their width (figs. 518, 531) 11

— Frontal aspect of head comparatively transverse (fig. 620); length of malar space 0.3—0.8 times basal width of mandible; hind coxa at most punctulate and somewhat rugose dorsally (fig. 616); both penultimate segments of antenna of ♀ 1.7—2.9 times their width (figs. 609, 621) 12

11. Subapical tooth of tarsal claw of ♀ comparatively stout, rather blunt and

subequal to the apical tooth, resulting in sub-bifurcate claws (figs. 522, 524); body mainly black; medially propodeum mainly coarsely reticulate; vein r of hind wing absent or at most an indistinctly developed remnant present (figs. 516, 519); pterostigma dark brown; basally hind basitarsus more or less blackish or dark brown and at least its apical half white; vertex smooth or punctulate (fig. 520) . . . . *carbonator* (Shestakov) (p. 330)

— Subapical tooth of tarsal claws of ♀ slender, sharp, much shorter than the apical tooth (figs. 534, 536, 707); body brownish and/or yellowish; propodeum (except for the carinae) indistinctly sculptured (fig. 537); vein r of hind wing present, but anterior half usually indistinctly developed (fig. 529); exceptionally largely absent; pterostigma and whole hind basitarsus yellowish; vertex coriaceous (fig. 538) . . . . *bohemani* (Bengtsson) (p. 332)

12. Vein r of hind wing present, at least as a brownish pigmented stripe (figs. 555, 607); basal quarter of vein SR of hind wing only pigmented, unsclerotized (fig. 555) 13

— Vein r of hind wing completely absent; basal quarter of vein SR of hind wing equally sclerotized as vein 1-M of hind wing (fig. 618) 14

13. Length of ovipositor sheath 0.08—0.12 times fore wing (fig. 553); apical two-thirds of hind tibia and metasoma yellowish . . . . *flagitator* (Curtis) (p. 334)

— Length of ovipositor sheath 0.25—0.26 times fore wing (fig. 602); apical two-thirds of hind tibia and mesosoma mainly blackish . . . . *nepalensis* spec. nov. (p. 340)

14. Vein 2-SC+R of hind wing long, transverse (fig. 618); base of vein SR of hind wing straight (fig. 631); tarsal claws with a ventral lamella (fig. 624); antenna, hind tibia and body, yellowish . . . . *crenulatus* spec. nov. (p. 341)

— Vein 2-SC+R of hind wing short, vertical (fig. 635); base of vein SR of hind wing weakly curved (fig. 641); tarsal claws with a subapical tooth (fig. 638); antenna mainly dark brown, but with a white or yellowish ring medially; body and apical 0.7 of hind tibia mainly brownish black . . . . *annulatus* spec. nov. (p. 342)

Subfamily EUPHORINAE Foerster

Foerster, 1862, Verh. naturh. Ver. preuss. Rheinl. 19: 228, 250.

Syn.: Perilitinae Foerster, 1862.

Diagnosis. — Antescutal depression and hypoclypeal depression absent; 1st discal cell of fore wing (sub)petiolate, vein 1-SR present or nearly so; dorsope of 1st tergite present or (less frequently) absent; 1st tergite of metasoma petiolate, subsessile or sessile, more or less narrowed in front of spiracles, exceptionally weakly narrowed behind spiracles; apical segment of antenna variable (figs. 767, 787, 847); occipital carina connected with the hypostomal carina above the mandibular base; veins a and CU1b of fore wing absent (fig. 836), exceptionally a short part of CU1b present (fig. 792); pronope of pronotum more or less developed (fig. 874); metapleural flange variable; hypostomal and prepectal carina present; lateral carina of scutellum absent; lateral carina of mesoscutum more or less

developed; vein m-cu of fore wing usually antefurcal or interstitial with 2-SR, exceptionally postfurcal; subbasal cell of hind wing usually large; antennal segments 15—50; lobes of mesoscutum equally convex; trochantelli simple, without teeth; scapus (sub)truncate apically; vein 2A of fore wing usually absent or shortly developed; 1st subdiscal cell of fore wing more or less open ventro-distally; plical lobe of hind wing and laterope of 1st tergite variable; maxillary and labial palpi with 6 and 3—4 segments, respectively; metasoma usually sparsely setose, less frequently densely and evenly setose; occipital carina present, at least laterally; postpectal carina absent or nearly so; hypopygium truncate apically, large to medium-sized; ovipositor straight or curved ventrad, usually with a small subapical notch.

Distribution. — Cosmopolitan. Contains three tribes: Meteorini Cresson, 1887; Centistini Čapek, 1970; Euphorini Foerster, 1862.

Tribus METEORINI Cresson

Cresson, 1887, Trans. Am. ent. Soc., Suppl.: 55, 60.

Syn.: Zelini Ashmead, 1900; Petiolarini Szépligeti, 1904; Zemiotini Van Achterberg, 1976.

Diagnosis. — Occipital carina complete; 3rd segment of labial palp reduced (figs. 809, 821) or (virtually) absent (figs. 759, 800); anterior tentorial pits deep, medium-sized (fig. 773) or large (fig. 781); mesopleuron more or less protruding antero-dorsally (fig. 772); medial lobe of mesoscutum more or less rounded anteriorly (figs. 755, 874); vein 2A of hind wing absent (fig. 388), or at most present as a vague stripe (figs. 750, 784); vein 2-R1 of fore wing absent (fig. 758), or (exceptionally) well developed (fig. 836); 1st tergite of metasoma petiolate and its spiracles situated submedially (figs. 754, 775, 852); vein r-m of fore wing present (fig. 18); 1st tergite widened apicad (figs. 754, 852).

Distribution. — Cosmopolitan. Contains two described genera: *Meteorus* Haliday, 1835, and *Zele* Curtis, 1832.

Genus **Zele** Curtis

Curtis, 1832, Br. Ent. 9: 415.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 49.
Shenefelt, 1970, id. 5(2): 220.
Čapek, 1970, Can. Ent. 102: 848.
Fischer, 1970, Wiss. Arbeiten Bgld. 44: 254—300, figs. 3, 6.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 222—224.
Čapek, 1972, Ent. Problémy 10: 133, 134, 136, 138.
Mason, 1973, Proc. ent. Soc. Wash. 75: 213—215.
Jakimavičius, 1974, Tr. AN Lit. SSR B2(66): 97.
Van Achterberg, 1976b, Tijdschr. Ent. 119: 37, 50, figs. 107, 111.
Tobias, 1976, Opr. Fauna SSSR 110: 113, fig. 33: 14—16.

Type-species: *Zele testaceator* Curtis.

Synonyms: *Zemiotes* Foerster, 1862, **Syn. nov.**; *Protelus* Foerster, 1862, **Syn. nov.**;

Meteorus auct. p.p.

Diagnosis. — Length of body 4.1—10.3, of fore wing 3.9—10.8 mm; antennal segments 29—50; length of 3rd segment of antenna 0.9—1.2 times 4th segment; length of maxillary palp 1.0—1.5 times height of head; length of malar space 0.1—0.7 times basal width of mandible; mandible with a pair of (more or less) protruding thin lamelliform carinae (figs. 809, 858), more or less twisted apically; ventral margin of clypeus rather wide, lamelliform, straight medially and well differentiated from clypeus (figs. 765, 781); eyes bare, immarginate, more or less converging ventrad (figs. 765, 793, 830, 862), larger in ♂ than in ♀; epistomal suture complete (fig. 803); propleural lamellae more or less developed (figs. 785, 796); notauli complete (figs. 790, 849); side of scutellum more or less rugose (figs. 755, 808, 811); scutellum sculptured medio-posteriorly (figs. 755, 785); episternal scrobe medium-sized, elliptical (figs. 748, 778, 785); metapleural flange more or less lamelliform (figs. 748, 796); propodeal spiracle small and round (figs. 748, 796); propodeal tubercles absent; propodeum with a more or less developed anterior transverse carina (figs. 754, 762, 775, 801); vein m-cu of fore wing more or less antefurcal (figs. 750, 758, 784); 1st discal cell of fore wing shortly petiolate anteriorly (figs. 758, 768, 836); short remnant of vein 2A of fore wing present (figs. 814, 827, 846); marginal cell of hind wing widened apicad (figs. 784, 788); vein SR1 of fore wing straight; vein r of hind wing present (fig. 788) or absent (fig. 758); tarsal claws with a large submedial lobe (figs. 752, 757, 791); length of hind femur 3.8—7.6 times its width; length of 1st tergite 1.6—4.1 times its apical width, its dorsope more or less developed (figs. 762, 794); at least apical half of 3rd and following tergites densely setose (figs. 783, 794); 2nd and following tergites smooth, only in *gracilis* weakly coriaceous-punctulate (fig. 852); length of ovipositor sheath 0.19—0.60 times fore wing, slender (fig. 843); length of hind tibial spurs 0.3—0.4 times hind basitarsus, subequal.

Distribution. — Widespread, but absent in the Afrotropical and Australian regions. The distribution is rather similar to that of the subgenus *Oulophus* of the genus *Homolobus* and may be due to the same factors, e.g., a primarily Holarctic centre of speciation, combined with a secondary centre in the Neotropical area.

Biology. — Endoparasites of larvae of the Geometridae Pyralidae, Noctuidae, Lasiocampidae, Lymantriidae, Arctiidae, Limacodidae, and Saturniidae. Aberrant records from Tortricidae, Momphidae, Douglasiidae, Yponomeutidae, Lyonetiidae, Gelechiidae, Conchylidae, Pterophoridae and Nymphalidae need to be confirmed.

Note. — There is some confusion about the gender of the genus *Zele* Curtis. Because it is frequently used in generic combinations (*Austrozele, Palinzele, Neozele, Xiphozele,* all belonging to other subfamilies) certainty about its gender is required. The name *Zele* is a fantasy-name which takes the gender expressly attributed to it by its author. If no gender is assigned or implied, the name is to be treated as masculine unless the ending is clearly a natural classical feminine or neuter one when the gender is that appropriate to the ending (according to Article 30a(ii) of the International Code of Zoological Nomenclature). Curtis (1832: 415) did not expressly attribute a gender to his new genus, while of the ten species

included, only two may imply a certain gender of *Zele*, viz., *thoracicus*, and *longicauda* . Thus Curtis himself was uncertain about the gender, furthermore also the ending is not a natural classical feminine or neuter one. Therefore the name *Zele* (and the derived names as well) has to be treated as a masculine noun according to Article 30a(ii) of the International Code.

Key to the species of the genus *Zele*

1. Precoxal suture smooth or only narrowly sculptured (figs. 748, 758, 766), if intermediate, then length of ovipositor sheath ca. 0.2 times fore wing (fig. 756); vein 1-M of hind wing 0.7—1.1 times vein cu-a (figs. 750, 758), exceptionally somewhat shorter; 1st tergite usually comparatively stout (figs. 754, 762, 775); vein cu-a of fore wing postfurcal (fig. 768) 2
— Precoxal suture widely sculptured, at least anteriorly or medially (figs. 778, 785, 796), if intermediate, then vein 1-M of hind wing shorter than 0.7 times vein cu-a (figs. 836, 855) or vein cu-a of fore wing antefurcal (fig. 798); 1st tergite comparatively slender (figs. 824, 839, 852, 864) or length of ovipositor sheath ca. 0.3 times fore wing (fig. 853) 4
2. Length of ovipositor sheath 0.19—0.28 times fore wing (figs. 756, 767); hind femur slender (figs. 761, 774), its length 5.2—6.4 times its width 3
— Length of ovipositor sheath 0.38—0.39 times fore wing (fig. 748); hind femur somewhat swollen (fig. 751), its length 4.4—5.1 times its width; North Palaearctic . . . . *annulicrus* (Thomson) (p. 363)
3. Body, hind tibia and its tarsus mainly dark reddish-brown; pterostigma of ♀ more or less brown; mesopleuron somewhat more sculptured (fig. 756); Palaearctic and North Nearctic . . . . *caligatus* (Haliday) (p. 364)
— Body, pterostigma, and hind leg of ♀, yellowish; mesopleuron comparatively smooth (fig. 766); South Nearctic . . . . *levis* (Muesebeck) (p. 365)
4. Scutellum protruding dorsad, with a tubercle (figs. 778, 785); laterope absent (figs. 778, 785); vertex punctate (figs. 779, 789) 5
— Scutellum at most rather strongly convex, without tubercle (figs. 796, 825); laterope present, at least shallowly (figs. 825, 843); vertex smooth or punctulate (fig. 850) 6
5. Tubercle of scutellum rounded apically (figs. 778, 780); dorsope of 1st tergite well developed (fig. 783); wing membrane hyaline; hind tibia brownish, only with blackish setae; South Neotropical . . . . . . *punctatus* spec. nov. (p. 367)
— Tubercle of scutellum sharp apically (figs. 785, 795); dorsope almost absent (fig. 794); wing membrane light brownish; apical 0.7 of hind tibia (at least in ♂) blackish; North Neotropical . . . . *tuberculifer* spec. nov. (p. 368)
6. Length of ovipositor sheath 0.41—0.60 times fore wing, longer than 1.5 times 1st tergite of metasoma (figs. 796, 815); vein cu-a of fore wing antefurcal (figs. 798, 814), exceptionally interstitial 7
— Length of ovipositor sheath 0.19—0.33 (exceptionally 0.37) times fore wing, shorter than 1.5 times length of 1st tergite (figs. 825, 834, 843, 853); vein cu-a of fore wing postfurcal (figs. 827, 855), seldom (sub)interstitial (fig. 836), and

exceptionally shortly antefurcal 9
7. Hind tarsus yellowish; eyes somewhat smaller, their dorsal length in ♀ 1.3—2.1 (in ♂ 1.2—1.6) times length of temple (fig. 817); West and Middle Palaearctic . . . . *chlorophthalmus* (Spinola) (p. 370)
— Hind tarsus whitish; eyes of ♀ comparatively large, their dorsal length 2.4—3.2 (in ♂ 1.8—2.3) times length of temple (fig. 892); (*niveitarsis* Cresson s.l.) 8
8. Hind tibia and pterostigma mainly dark brown; East Palaearctic and Oriental . . . . *niveitarsis* f. *peronatus* (Shestakov) (p. 370)
— Hind tibia and pterostigma mainly brownish-yellow; Nearctic . . . . *niveitarsis* f. *niveitarsis* (Cresson) (p. 369)
9. Scutellum rather strongly convex (figs. 811, 825); surroundings of veins 1-M, 1-CU1, and r of fore wing dark brown pigmented (fig. 827); basal two-thirds of hind tibia, all trochanters and trochantelli, white; pterostigma of ♀ dark brown, with base and apex whitish; malar space of ♀ very short, its length 0.1 times basal width of mandible (fig. 830); South Nearctic . . . . *picinervis* spec. nov. (p. 373)
— Scutellum weakly convex (fig. 834); surroundings of veins 1-M, 1-CU1 and r of fore wing hyaline or faintly brownish; basal half of hind tibia, all trochanters and trochantelli, yellowish or dark brown; pterostigma of ♀ uniformly yellowish or dark brown; length of malar space of ♀ 0.3—0.4 times basal width of mandible, somewhat longer (figs. 842, 862) 10
10. Hind femur stout, its length 3.8—4.4 times its maximum width (fig. 840); head more transverse (fig. 838); vein 2-R1 of fore wing well-developed, somewhat longer than vein r (fig. 836); Nearctic . . . *crassifemur* (Muesebeck) (p. 374)
— Hind femur slender, its length 5.1—7.6 times its maximum width (fig. 860); head less transverse (figs. 850, 863); vein 2-R1 of fore wing rather short, usually shorter than vein r (figs. 846, 855) 11
11. Length of vein r of fore wing 1.1—1.2 times vein 3-SR (fig. 846); 2nd tergite evenly setose and finely coriaceous-punctulate (fig. 852); base of 1ste tergite and ventral half of temple, yellowish white; length of ovipositor sheath ca. 0.37 times fore wing (fig. 843); South Palaearctic . . . . *gracilis* spec. nov. (p. 375)
— Length of vein r of fore wing 0.3-0.6 times vein 3-SR (figs. 855, 868); at least basal half of 2nd tergite bare and smooth (fig. 853); base of 1st tergite and ventral half of temple, brownish-yellow or blackish; length of ovipositor sheath 0.19—0.33 times fore wing (fig. 853); Holarctic; (*albiditarsus* Curtis s.l.) 12
12. Length of vein 1-M of hind wing 0.9—1.3 times cu-a, subequal (fig. 868) . . . . *albiditarsus* f. *pallitarsis* (Cresson) (p. 379)
— Length of vein 1-M of hind wing 0.3—0.8 times vein cu-a, usually much shorter than cu-a (fig. 855) 13
13. Middle of hind tarsus yellowish or infuscated, if intermediate, then similarly coloured as middle of hind femur; length of fore wing usually less than 8 mm . . . . *albiditarsus* f. *deceptor* (Wesmael) (p. 377)
— Middle of hind tarsus white or whitish-yellow, lighter coloured than middle of

hind femur; length of fore wing usually more than 8 mm . . . . *albiditarsus* f. *albiditarsus* Curtis (p. 380)

Zele annulicrus (Thomson) comb. nov.
(figs. 748—755)

Thomson, 1895, Opusc. ent. 20: 2161 (as *Meteorus*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 52, 53.
Fischer, 1970, Wiss. Arbeiten Bgld. 44: 258.

Lectotype, ♀, length of body 4.2, of fore wing 4.4 mm.

Head. — Remaining antennal segments 11, 3rd segment 0.9 times 4th segment, length of 3rd and 4th segments 3.4 and 3.6 times their width, respectively; length of maxillary palp 1.1 times height of head; dorsal length of eye 1.4 times temple; temple weakly roundly narrowed posteriad (fig. 749); POL : ∅ ocellus : OOL = 14 : 5 : 6; frons weakly concave, smooth; vertex convex, punctulate; face weakly convex, indistinctly punctulate; clypeus strongly convex, punctate (fig. 753); length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.5 times its height; side of pronotum largely smooth, medially crenulate and ventro-anteriorly and posteriorly rugose (fig. 748); epicnemial area crenulate anteriorly, dorsally rugose near posterior subalar depression; precoxal suture narrowly crenulate medially (fig. 748); metapleural flange medium-sized, apically lamelliform and rounded (fig. 748); metapleuron almost smooth, ventrally rugose; notauli indistinctly crenulate, narrow (fig. 755); mesoscutal lobes slightly punctulate; scutellum convex, punctulate; surface of propodeum with a small areola medio-anteriorly and a well-developed medial carina and costulae (fig. 754), its surroundings almost smooth; posterior part of propodeum not separated from antero-dorsal part (fig. 748).

Wings. — Fore wing: r : 3-SR : SR1 = 4 : 7 : 37; cu-a postfurcal; 1-CU1 : 2-CU1 = 2 : 15; 2-SR : 3-SR : r-m = 10 : 7 : 7. Hind wing: r mainly absent (fig. 750); length of 1-M 0.9 times cu-a.

Legs. — Hind coxa punctulate; hind femur somewhat curved (fig. 751); length of femur, tibia, and basitarsus of hind leg 4.4, 10.2 and 8.6 times their width, respectively.

Metasoma. — Length of 1st tergite 1.6 times its apical width, its surface superficially and remotely striate (fig. 754); dorsal carinae present in front of spiracles; dorsope and laterope large and deep; 2nd tergite smooth and bare; length of ovipositor sheath 0.38 times fore wing.

Colour. — Dark brown; scapus, pedicellus, clypeus, labrum, mandibles mainly, palpi, pterostigma, tegulae, postero-dorsal corner of pronotum, and legs, yellowish; hind tibia basally whitish, its apical three-quarters and hind tarsus darkened.

Lectotype in ZIL, Lund: "Hbg", "*Meteorus annulicrus* Th., Type, det. Fischer", "1977, 39". Paralectotypes: 4 specimens, of which 1 ♀ and 2 ♂ were examined. 1 ♂, "Hall."; 1 ♀, "Bö.", and 1 ♂, "Riht", all ZIL. Variation: Antennal segments 31; length of fore wing 4.6—4.7 mm; length of 1st tergite 1.6—1.7 times its apical

width; length of hind femur 4.4—5.1 times its apical width; length of ovipositor sheath 0.38—0.39 times fore wing; pterostigma of ♂ dark brown.

Zele caligatus (Haliday) comb. nov.
(figs. 756—765)

Haliday, 1835, Ent. Mag. 3: 25 (as *Meteorus*).
Ruthe, 1862, Berl. ent. Z. 6: 22, 23 (*Meteorus neesii*).
Ashmead, 1902, Proc. Wash. Acad. Sci. 4: 247 (*Dyscoletes alaskensis*). **Syn. nov.**
Fahringer, 1930, Ark. Zool. 21A: 8 (*Meteorus caligatus* var. *sibiricus*). **Syn. nov.**
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 51, 55, 56.
Fischer, 1970, Wiss. Arbeiten Bgld. 44: 258.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 222.
Mason, 1973, Proc. ent. Soc. Wash. 75: 214.

Lectotype, ♀, length of body 5.1, of fore wing 5.3 mm.

Head. — Antennal segments 35, 3rd segment equal to 4th segment, length of 3rd and 4th segments both 3.2 times their width, length of both penultimate segments 1.3 and 1.6 times their width; length of maxillary palp 1.3 times height of head; dorsal length of eye 2.0 times temple; temple roundly narrowed posteriad (fig. 760); POL : ∅ ocellus : OOL = 7 : 4 : 5; frons smooth, but with some rugosity near antennal sockets, almost flat; vertex convex, weakly punctulate; face rather flat, punctate medially and near antennal sockets, laterally punctulate (fig. 765); clypeus convex, punctate; length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum largely punctulate, antero-medially and apically crenulate and indistinctly rugose ventrally (fig. 756); epicnemial area mainly smooth, rugose postero-dorsally; precoxal suture narrowly and irregular crenulate, anteriorly and posteriorly almost smooth (fig. 756); metapleural flange medium-sized, narrowly lamelliform apically (fig. 756); metapleuron reticulate, only dorsally almost smooth; notauli narrowly crenulate (fig. 764); mesoscutal lobes indistinctly punctulate; scutellum rather convex, weakly punctulate; surface of propodeum mainly smooth anteriorly, except for a weakly developed transverse carina and a short part of the medial carina (fig. 762), posteriorly rugose; posterior part of propodeum not separated from its antero-dorsal part (fig. 756).

Wings. — Fore wing: r : 3-SR : SR1 = 10 : 24 : 114; cu-a postfurcal; 1-CU1 : 2-CU1 = 1 : 20; 2-SR : 3-SR : r-m = 19 : 12 : 12. Hind wing: r absent; length of 1-M 0.9 times cu-a.

Legs. — Hind coxa weakly punctulate; hind femur rather straight (fig. 761); length of femur, tibia and basitarsus of hind leg 5.3, 10.2 and 7.7 times their width, respectively.

Metasoma. — Length of 1st tergite 1.7 times its apical width, its surface indistinctly rugulose, almost smooth (fig. 762); dorsal carinae of 1st tergite absent; laterope and dorsope large and deep (fig. 756); 2nd tergite mainly bare and smooth; length of ovipositor sheath 0.19 times fore wing.

Colour. — Dark reddish-brown; palpi, mandibles, clypeus ventrally, antenna (except apically), tegulae, dorso-posterior corner of pronotum, legs (but hind tibia

and tarsus mainly infuscated), 2nd and 3rd tergites and their sternites, apex of hypopygium, apex of ovipositor sheath, yellowish; pterostigma brown; hind tibia basally with a whitish ring.

Lectotype in NMI, Dublin: "Jullymore", "Ireland, Haliday, 20.2.82/Box 8, A.W.S.", "*Meteorus caligatus* Hal., det. Muesebeck", "*Meteorus caligatus* Hal., ♀, Type!, AWS. 29.7.1948". Lectotype of *Perilitus neesii* Ruthe, 1862, in BM, London: ♀, "Type H.T.", "B.M. type Hym., 3.c.758", "em. Type. Hym. *Meteorus neesii* Ruthe, 1862", "*P. Neesii* m.", "*P. neesii* Rut.", "59.101 Germany", "Ruthe Coll. 59.101". Holotype of *Meteorus sibiricus* Fahringer, 1930, in NR, Stockholm: ♀, "Kamtschatka, Malaise", "1870", "*Meteorus* ♀ *caligatus* Hal. var. *sibiricus* m." (in Fahringer's handwriting), "405, 77", "Riksmuseum Stockholm". Holotype of *Dyscoletes alaskensis* Ashmead, 1902, in USNM, Washington: ♂, "Popoff Island, Alaska, July 11", "99", "Harriman Expedition '99, T. Kincaid, Collector", "♂, Type, No. 5703, U.S.N.M.", "*Dyscoletes alaskensis* Ashm. ♂" (in Ashmead's handwriting). These three holotypes were examined and proved to be rather typical specimens of *caligatus*.

Additional specimens examined: 26 ♀ and 18 ♂. From the Palaearctic region: Finland (Sääksmäki, Kivirikko; Kenru), Denmark (no locality), USSR (Irkutskaja obl., S. Siberia), Japan (Mt. Arakura, 1300 m; Kamitakai, 800 m, both Nagano), and Italy (Campi, Riva s. Garda, 1200 m) (CNC, HC, WHC, RMNH, UZM). From the Nearctic region: Alaska (Haines), North West Territories (Norman Walls), British Columbia (Woodfibre; Gison's Landing; Triumph Bay; Coquitlan L.; Seymour Cr.; Squamish; Canyon Cr.; Harrison L.; Hixon; Howe Sound), Alberta (E. Jaspar Gate; Clearwater), Ontario (Stittsville), Quebec (Mt. Lyall), and Newfoundland (St. Georges) (CNC, USNM, RMNM).

Variation: Length of fore wing 4.6—5.9 mm; antennal segments 35—37; length of ovipositor sheath 0.19—0.28 times fore wing; length of malar space 0.4 times basal width of mandible; length of hind femur 5.2—6.1 times its width; length of 1st tergite 1.7—1.8 times its apical width; length of vein 1-M of hind wing 0.6—1.0 times vein cu-a of hind wing; cocoon whitish.

Known hosts of examined specimens belong all to the genus *Eupithecia* (Geometridae, Lepidoptera): *E. luteata* Packard, *E. palpata* Packard, *E. ?usurpata* Pears., *E. satyrata* (Hübner), *E. filmata* Pears., and *E. indigata* (Hübner).

Zele levis (Muesebeck) comb. nov.
(figs. 766-776)

Muesebeck, 1923, Proc. U.S. natn. Mus. 63: 11 (as *Meteorus*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 76.

Holotype, ♀, length of body 4.5, of fore wing 5.0 mm.

Head. — Antennal segments 29, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 5.0 and 4.2 times their width, respectively, length of both penultimate segments 1.7 times their width (fig. 767); length of maxillary palp 1.3 times height of head; dorsal length of eye 2.1 times temple; temple roundly narrowed posteriad (fig.770); POL : ∅ ocellus : OOL = 14 : 9 : 8; frons almost flat,

smooth; vertex weakly convex, smooth; face rather flat, somewhat weakly punctulate; clypeus convex, almost smooth (fig. 773); length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum densely punctulate, with some crenulae medially and some striae apically (fig. 766); epicnemial area largely smooth, postero-dorsally punctate-rugulose; precoxal suture smooth, except for some short crenulae medially (fig. 766); metapleural flange rather large, lamelliform; metapleuron largely smooth, ventrally punctulate; notauli indistinctly developed dorsally, almost smooth (but in other specimens finely rugose); mesoscutal lobes faintly punctulate; scutellum rather convex and punctulate; surface of propodeum finely rugose, only anteriorly smooth, anterior transverse carina well developed, and posteriorly with a short medial carina (fig. 775); posterior part of propodeum not separated from antero-dorsal part of propodeum (fig. 766).

Wings. — Fore wing: r : 3-SR : SR1 = 6 : 11 : 64; cu-a postfurcal; 1-CU1: 2-CU1 = 3 : 32; 2-SR : 3-SR : r-m = 16 : 11 : 10. Hind wing: r present posteriorly (fig. 768); length of 1-M 1.1 times cu-a.

Legs. — Hind coxa punctulate; length of femur, tibia and basitarsus of hind leg 6.4, 12.5, and 9.0 times their width, respectively.

Metasoma. — Length of 1st tergite 2.0 times its apical width, its surface striate and basally rugose (fig. 775); dorsal carinae of 1st tergite weakly developed in front of dorsope; dorsope and laterope deep and large (fig. 766, 775); 2nd tergite mainly bare and smooth; length of ovipositor sheath 0.19 times fore wing.

Colour. — Brownish-yellow; palpi and base of hind tibia, whitish; eyes greenish iridescent.

Holotype in CU, Ithaca: "Jemez Springs, IX.6-13, N.M., John Woodgate", "*Meteorus levis* Mues., Type, Det. Mues.", "Holotype Cornell U., No. 616.1". Additional specimens of *levis* examined: 6 ♀ and 1 ♂. From Mexico (Dgo., 3 mi. E. El Salto, 8500 ft; id., 10 mi. W. El Salto, 9000 ft; Chis., 9600 ft, Zontehuitz, nr. S. Christ.), California (Berkeley), and Wyoming (5 mi. W. New Castle, 4200 ft). Variation: Length of fore wing 5.0—5.9 mm; antennal segments 29—33; length of hind femur 6.3—6.4 times its width; length of vein 1-M of hind wing 0.8—1.1 times vein cu-a of hind wing; length of 1ste tergite 1.7—2.2 times its apical width; length of ovipositor sheath 0.19 times fore wing; ♂ from Mexico has pterostigma, metasoma basally and apically, propodeum, hind tibia (except its base) and hind tarsus, more or less dark brown (CNC, USNM, RMNH).

From Colombia (Caldas, 3300—3500 m (CNC)) I have examined 2 ♀ and 1 ♂ which are intermediate between *levis* and *caligatus*. The females have the shape of the 1st tergite and face of *levis*, and the hind leg and metasoma yellowish brownish (but 1st tergite infuscated). Head and mesosoma are mainly dark brown, the pterostigma is rather infuscated and the precoxal suture is narrowly and rather irregularly sculptured as in *caligatus*. The male is completely melanistic, with also the legs more or less infuscated. Further collecting is needed to make a decision about the synonymy of *levis* with *caligatus*.

Zele punctatus spec. nov.
(figs. 777—784, 813)

Holotype, ♀, length of body 8.6, of fore wing 8.4 mm.

Head. — Antenna absent except for scapus and pedicellus, 3rd segment of allotype 1.2 times 4th segment, and length of 3rd and 4th segment 3.9 and 3.2 times their width, respectively; maxillary palp subequal to height of head; dorsal length of eye 2.2 times temple; temple punctulate and roundly narrowed posteriad (fig. 779); POL : ∅ ocellus : OOL = 9 : 6 : 1; frons smooth, concave behind antennal sockets; vertex rather flat, punctate (fig. 779); face rather flat, densely punctate (fig. 781); clypeus strongly convex, coarsely punctate; length of malar space 0.3 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum largely reticulate-rugose, dorsally punctate and antero-medially crenulate (fig. 778); epicnemial area rugose-reticulate; precoxal suture crenulate-rugose dorsally (only rather smooth posteriorly) and coarsely reticulate-punctate ventrally (fig. 778), its surroundings punctate; metapleural flange large, lamelliform and rounded apically; metapleuron coarsely reticulate; notauli crenulate (fig. 782); mesoscutal lobes densely punctate (fig. 782); scutellum with rounded tubercle, punctate (fig. 778, 780); surface of propodeum coarsely reticulate, its medial carina rather weakly developed and without an areola; posterior part of propodeum rather separated from antero-dorsal part of propodeum (fig. 778).

Wings. — Fore wing: r : 3-SR : SR1 = 10 : 14 : 89; cu-a postfurcal; 1-CU1 : 2-CU1 = 2 : 17; 2-SR : 3-SR : r-m = 10 : 7 : 8. Hind wing: r faintly developed; length of 1-M 0.8 times cu-a.

Legs. — Hind coxa densely and coarsely punctate; length of femur, tibia and basitarsus of hind leg 5.6, 12.1 and 12.0 times their width.

Metasoma. — Length of 1st tergite 2.6 times its apical width, its surface smooth anteriorly, posterior half rugose (fig. 783); dorsal carinae of 1st tergite absent; laterope absent (fig. 778); dorsope deep, medium-sized (fig. 783); 2nd tergite mainly bare and smooth; length of ovipositor sheath 0.40 times fore wing.

Colour. — Brownish-yellow; hind tarsus (except the yellowish telotarsus) white; apical three-quarters of hind tibia blackish setose; ovipositor sheath dark brown; wing membrane hyaline; palpi somewhat infuscated.

Holotype in IML, Tucumán: "R. A. Tucuman, Aconguya, XI. (1)946, Coll. R. Golbach", "Inst. M. Lillo", "*Zemiotes* sp., Det. Muesebeck". Paratypes: 3 specimens, 1 specimen without metasoma, topotypic with holotype (IML); 1 ♂ (allotype, IML), "R. A. Tucuman, Dpto. Tafi, 18.XII.50, Coll. Golbach"; 1 ♂ (RMNH), topotypic with allotype.

Note. The protuberant scutellum indicates a relationship with the South Nearctic *Zele picinervis* spec. nov., but *punctatus* is more coarsely sculptured, has the wing membrane hyaline, and the ovipositor is longer.

Zele tuberculifer spec. nov.
(figs. 785—795, 812)

Holotype, ♂, length of body 9.0, of fore wing 7.8 mm.

Head. — Antennal segments 41, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 4.2 and 3.6 times their width, respectively, length of both penultimate segments 1.8 and 2.2 times their width; length of maxillary palp 1.1 times height of head; dorsal length of eye 2.2 times temple; temple roundly narrowed posteriad, punctulate (fig. 789); POL : ∅ ocellus : OOL = 19 : 11 : 6; frons deeply concave behind antennal sockets, mainly smooth; vertex punctate; face rather flat, densely reticulate-rugose (fig. 793); clypeus strongly convex, reticulate-rugose; length of malar space 0.5 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.5 times its height; side of pronotum densely punctate, medially coarsely crenulate and ventrally reticulate-rugose (fig. 785); epicnemial area anteriorly rather smooth, posteriorly rugose; precoxal suture dorsally narrowly crenulate, medially and ventrally rather coarsely punctate (fig. 785); metapleural flange large, wide, truncate and lamelliform apically; metapleuron coarsely rugose-reticulate; notauli remotely and widely crenulate (fig. 790); mesoscutal lobes densely punctulate; scutellum with a sharp tubercle and punctate (figs. 785, 790, 795); surface of propodeum coarsely reticulate, with a medial carina; posterior part of propodeum separated from antero-dorsal part of propodeum (fig. 785).

Wings. — Fore wing: r : 3-SR : SR1 = 13 : 16 : 94; cu-a postfurcal; 1-CU1 : 2-CU1 = 1 : 16; 2-SR : 3-SR : r-m = 9 : 8 : 7. Hind wing: r present as a brownish stripe (fig. 788); length of 1-M 0.9 times cu-a.

Legs. — Hind coxa densely and coarsely punctate (fig. 785); length of femur, tibia and basitarsus of hind leg 6.1, 11.6 and 10.0 times their width, respectively.

Metasoma. — Length of 1st tergite 2.8 times its apical width, its surface smooth anteriorly, but posteriorly (behind the spiracles) rugulose (fig. 794); dorsal carinae of 1st tergite absent; laterope absent; dorsope almost absent (fig. 799); 2nd tergite mainly bare and smooth.

Colour. — Reddish-brown; pterostigma, wing veins, antenna (but scapus and antenna medially more brownish), and posterior two-thirds of hind tibia, mainly dark brown or blackish; hind tarsus (except telotarsus) yellowish-white; wing membrane light brownish.

Holotype in RMNH, Leiden: "Museum Leiden, North Panama, 1050 m, Fortuna, Chiriqui, 8°44′, 82°15′W, 19.X.1976, H. Wolda, at light".

Zele niveitarsis (Cresson) comb. nov.
(figs. 796—807)

Cresson, 1872, Can. Ent. 4: 81 (as *Perilitus*).
Shestakov, 1940, Ark. Zool. 32A: 16 (*Meteorus peronatus*). **Syn. nov.**
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 82, 86.
Čapek, 1970, Can. Ent. 102: 848.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 222.
Mason, 1973, Proc. ent. Soc. Wash. 75: 214.

Zele niveitarsis f. **niveitarsis** (Cresson)
(figs. 796—807)

Lectotype, ♀, length of body 7.5, of fore wing 6.7 mm.

Head. — Antennal segments 40, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.6 and 3.4 times their width, respectively, length of both penultimate segments 2.0 times their width; length of maxillary palp 1.2 times height of head; dorsal length of eye 3.0 times temple; temple rather directly narrowed posteriad (fig. 802); POL : ∅ ocellus : OOL = 8 : 6 : 2; frons concave, with some striae anteriorly; vertex rather flat, punctulate; face flat, finely and densely punctate (fig. 803); clypeus convex and remotely punctate; length of malar space 0.2 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum largely reticulate-rugose, with some crenulae antero-medially, and dorsally smooth (fig. 796); epicnemial area largely smooth, anteriorly crenulate; precoxal suture densely punctate, dorsally narrowly crenulate (fig. 796); metapleural flange large, rounded and narrowly lamelliform apically (fig. 796); metapleuron coarsely reticulate; notauli finely crenulate (fig. 807); mesoscutal lobes finely and densely punctulate; scutellum convex, finely punctulate; surface of propodeum with a long medial carina anteriorly, and rest of surface remotely and coarsely reticulate and areolate (fig. 801); posterior part of propodeum separated from antero-dorsal part of propodeum (fig. 796).

Wings. — Fore wing: r : 3-SR : SR1 = 4 : 11 : 45; cu-a antefurcal; 2-M+CU1 : 1+2-CU1 = 1 : 18; 2-SR : 3-SR : r-m = 13 : 11 : 7. Hind wing: r present, weakly pigmented (fig. 798); length of 1-M 0.7 times cu-a.

Legs. — Hind coxa weakly punctate; length of femur, tibia and basitarsus of hind leg 5.1, 11.8, and 12.2 times their width, respectively.

Metasoma. — Length of 1st tergite 2.1 times its apical width, its surface transversely rugose basally, more irregularly and remotely rugose posteriorly (fig. 801); dorsal carinae present in front of laterope; laterope and dorsope deep and large (fig. 796, 801); 2nd tergite only medially setose, smooth; length of ovipositor sheath 0.43 times fore wing.

Colour. — Brownish-yellow; all tibiae basally and entire tarsi, white or nearly so; telotarsi, hind tibia medially and apically, and antenna, somewhat darkened; pterostigma and tegulae, light yellowish; stemmaticum and ovipositor sheath, dark brown; tip of ovipositor sheath indistinctly yellowish; wings hyaline; eyes greenish iridescent.

Lectotype in ANSP, Philadelphia: "Mass.", "Type No. 1766", "*Perilitus niveitarsis* Cr./*Perilitus albitarsis* Cresson". Paralectotypes: 1 ♀ and 3 ♂, topotypic, not examined. Additional specimens examined (15 ♀ and 8 ♂) from the Nearctic region: Ontario (Blackbury; Ft. Francis), Quebec (Quebec; Tenaga); Nova Scotia (Smith's Cove), Massachusetts (Williamstown; Sterking), New Jersey (Moorestown), Main (Bar Harbor; Augusto; Mt. Desert), New York (Orient; Riverhead), Kansas (Riley Co.), Wisconsin (Gibson Lake, Polk Co.), and Connecticut (Stafford Springs) (USNM, CNC, RMNH).

Variation: Dorsal length of eye of ♀ 2.4—3.2 times temple (1.8—2.3 times in ♂); length of ovipositor sheath 0.42—0.60 times fore wing, longer than 1.5 times 1st tergite; length of vein 1-M of hind wing 0.7—0.8 times vein cu-a; sometimes head posteriorly, stemmaticum and mesosoma anteriorly more or less dark brown and hind tibia blackish apically; hind tibia of ♂ and antenna mainly dark brown or yellowish brown; pterostigma light brown; vein cu-a of fore wing antefurcal or interstitial. The dense silken cocoon is whitish, spindle-shaped, in a darker and larger lepidopterous cocoon.

Known hosts of examined specimens belong all to the Pyralidae (Lepidoptera): *Salebria virgatella* (Clements) on *Robinia*, *S. contatella* Grote, *Acrobasis rubrifasciella* Packard on *Alnus*; *A. betulella* Hulst, *A. ostryella* (?), *A. sylviella* (?), *A. comptomiella* Hulst, and *Meroptera pravella* (Grote).

Zele niveitarsis f. **peronatus** (Shestakov)

Holotype, ♀, length of fore wing 5.9 mm; dorsal length of eye 2.4 times temple; vein cu-a of fore wing antefurcal; 2-M + CU1 : 1 + 2-CU1 = 5 : 66; vein 1-M of hind wing 0.4 times vein cu-a; antennal segments 39; length of ovipositor sheath 0.46 times fore wing and 1.7 times length of 1st tergite; pterostigma and body, dark brown; 1st tergite basally, mesopleuron dorsally, face, clypeus, and basal half of antenna, brownish; fore and middle legs, tegulae, and hind trochanters, yellowish; apical three-quarters of hind tibia dark brown, its basal quarter yellowish white; hind coxa and its femur, brown; hind tarsus mainly white, but basally dark brown.

Holotype in NR, Stockholm: "Vladivost., Sedanka/10/8, 1930, Malaise", "*Meteorus peronatus* sp. n. typ., det. Shestakov", "Holotype of *peronatus* Shestakov, det. T. Huddleston, 1976", "406, 77", "Riksmuseum Stockholm".

Additional specimens examined: 1 ♀ from Sumatra (N. Sumatra, Bivouac 3, Mt. Bandahara, ca. 1810 m, 3°45′N, 95°45′E, 10—16.VII.1975, J. Krikken, no. 25 (RMNH, 1 ♀ (ex *E. pylonitis* (?)) and 1 ♂ (ex *D. abietella* (?)) from Lower Topa (?) (both USNM). Variation: Length of fore wing 5.9—8.1 mm; antennal segments 39—43; length of 1st tergite 2.3—2.8 times its apical width; length of ovipositor sheath 0.46—0.50 times fore wing; dorsal length of eye 2.4—3.1 times temple (1.8 times in ♂).

Zele chlorophthalmus (Spinola) comb. nov.
(figs. 814—824)

Spinola, 1808, Insect. Liguriae 2: 133, 134 (as *Bracon*).
Nees, (1811) 1812, Mag. Ges. nat. Fr. Berl. 5: 21 (*Bracon chrysophthalmus*). **Syn. nov.**
Thunberg, 1822, Mem. Acad. sci. St. Petersbourg 8: 263 (*Ichneumon nudator*). **Syn. nov.**
Costa, 1884, Rc. Accad. Sci. fis. mat., Napoli 22: 171 (*Meteorus splendens*). **Syn. nov.**
Thomson, 1895, Opusc. ent. 20: 2150 (*Meteorus* (*Zemiotes*) *nigricollis*). **Syn. nov.**
Wagner, 1928, Ver. naturw. Unterh. Hamb. 20: 7.
Cavro, 1954, Suppl. Bull. Soc. ent. N. Fr. 75: 109.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 58, 59, 81, 82.
Shenefelt, 1970, id. 5(2): 222.
Fischer, 1970, Wiss. Arbeiten Bgld. 44: 258, 268—270.

Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 223.
Čapek, 1972, Ent. Problémy 10: 134, 136.
Mason, 1973, Proc. ent. Soc. Wash. 75: 213—215.
Tobias, 1976, Opr. Fauna SSSR 110: 113, fig. 33: 14, 15.

Neotype, ♀, length of body 7.4, of fore wing 6.4 mm.

Head. — Antennal segments 39, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 4.2 and 4.0 times their width, respectively, length of both penultimate segments 2.0 and 2.3 times their width (fig. 819); length of maxillary palp 1.2 times height of head; temple weakly roundly narrowed posteriad (fig. 817); dorsal length of eye 1.3 times temple (fig. 817); POL : ∅ ocellus : OOL = 12 : 9 : 6; frons mainly smooth, weakly concave; vertex convex, slightly punctulate; face rather flat, punctulate; clypeus convex and punctate; length of malar space 0.1 times basal width of mandible, eyes almost touching mandibular condylus.

Mesosoma. — Length of mesosoma 1.5 times its height; side of pronotum punctulate, medially and ventrally reticulate-rugose (fig. 815); epicnemial area crenulate anteriorly and posteriorly punctate-rugose; precoxal suture widely reticulate-punctate, dorsally indistinctly crenulate (fig. 815); metapleural flange rather large, lamelliform apically; metapleuron largely rugose-reticulate, dorsally weakly sculptured notauli rather widely crenulate (fig. 818); mesoscutal lobes punctulate; scutellum rather convex, punctulate; surface of propodeum rather coarsely reticulate-rugose, only smooth anteriorly (fig. 824), with a medial carina; posterior part of propodeum not separated from antero-dorsal part (fig. 815).

Wings. — Fore wing: r : 3-SR : SR1 = 7 : 15 : 70; cu-a antefurcal; 2-M+CU1 : 1+2-CU1 = 3 : 52; 2-SR : 3-SR : r-m = 24 : 15 : 14. Hind wing: remnant of r present (fig. 814); length of 1-M 0.7 times cu-a.

Legs. — Hind coxa punctulate; length of femur, tibia and basitarsus of hind leg 6.2, 12.5, and 12.0 times their width, respectively.

Metasoma. — Length of 1st tergite 2.4 times its apical width, its surface behind dorsope rugulose-punctate (fig. 824); dorsal carinae short anteriorly, in front of dorsope; laterope large and deep (fig. 815); dorsope medium-sized, deep (fig. 824); 2nd tergite mainly bare and smooth; length of ovipositor sheath 0.42 times fore wing.

Colour. — Brownish-yellow; apical half of antenna and ovipositor sheath (except the apex) dark brown; eyes greenish iridescent.

Neotype of *Bracon chlorophthalmus* Spinola to be deposited in the collection of RMNH, Leiden: "Holland, Asperen, 8.IX.1972, C. J. Zwakhals", "♀, *M.* (*Zemiotes*) *chrysophthalmus* (Nees), det. C. v. Achterberg, 1973".

According to Mr. T. Huddleston, who kindly examined the holotype of *Meteorus splendens* Costa, 1884 (♀, Museum of Naples), *splendens* agrees with my interpretation of *chlorophthalmus*. Length of fore wing 4.0 mm, length of ovipositor sheath 0.44 times fore wing and 1.9 times length of 1st tergite, propodeum postero-dorsally and anterior half of 1st tergite darker than rest of body (blackish according to Costa). The type bears two labels: "Decimoputzu 4" and "*Meteorus splendens*" (the latter in what is probably Costa's handwriting). The type-locality is situated at the South of Sardinia, nr. Cagliari.

Mr. Huddleston also examined the holotype of *Ichneumon nudator* Thunberg, 1822 (♂, Thunberg Collection, Uppsala), which proved to have been correctly synonymized with *Bracon chrysophthalmus* Nees in the past. The holotype of *Meteorus* (*Zemiotes*) *nigricollis* Thomson, 1895 (♀, ZIL, Lund: "Degeberga", "*nigricollis* m.", "holotype *Meteorus* (*Zemiotes*) *nigricollis* T., det. T. Huddleston, 1976", "1977, 40") agrees well with the neotype of *chlorophthalmus*. The eyes are slightly less convex, length of eye 1.3 times temple, POL : ∅ ocellus : OOL = 16 : 9 : 9, frons striate anteriorly, length of fore wing 6.4 mm, length of ovipositor sheath 0.50 times fore wing, length of 1st tergite 2.2 times its apical width, mesosoma mainly dark brown, middle of frons and vertex faintly infuscated.

The type of *Bracon chrysophthalmus* Nees, 1812, is lost; a neotype is selected from the Wesmael Collection, because Wesmael is the first revisor of this species. The neotype of *chrysophthalmus* (♀, KBIN, Brussels: "Coll. Wesmael", "1743", "*Perilitus* ♂♀ *chrysophthalmus* N. v. Es., det. C. Wesmael", "type") agrees well with the descriptions by Nees and Wesmael (1835: 24—26) and with the neotype of *chlorophthalmus*: length of fore wing 6.0 mm, length of ovipositor sheath 0.49 times fore wing, eyes rather flat, and length of malar space 0.3 times basal width of mandible.

Additional specimens examined (89 ♀ and 41 ♂) from: Finland (U. Mellunkylä; Mariehamn), Sweden (Degeberga), Denmark (Bornholm; Nordsjølland; Sj. Jungshoved; Ebsjorg; Allnye; Adserbo; Stube in Sondbg), England (Dartmoor, SD, Lustleigh; Hants., Hawkley Warren; Whetstone, Hertfordshire; Southampton; Berks., Windsor Forest; SR, Claygate; H., Bricket Wood), Netherlands (Oostkapelle; Melissant; Oostvoorne; nr. Breda; Heerde (G.); Putten (G.); Meijendel; Castelre; Udenhout; Savelsbos; Tilburg; Assel; Crailo; Venlo; Bergen op Zoom; Gliphoeve; Tegelen; Zundert, De Krochten; Meinweg, Melick & Herkenbosch; Texel, landside dunes nr. Fonteinsnol; St. Pietersberg (ex *Crataegus* stem); Middelharnis; Naardermeer, Ouddorp; Wijster; Veenhuizen; Herpen; Voorburg; Berghem), West Germany (Annatal nr. Honnef, Siebengeb.; nr. Eichstadt); Czechoslovakia (B. Štiavnica), Austria (Piesting; Leitha Geb.; Donnerskirchen; Innsbruck), Poland (Gdansk), USSR (Tsav, Armenia; MSSR, Benderespsjij; Moldavia, C. Choresji, garden; Jonava, Dukstas), Bulgaria (Rodopi, Nicoloro); France (Baton; Lille Nord; Tours; Paris), and Spain (Santander, Potes; 25 km SW Salou) (RMNH, LH, CVR, BM, CNC, UZM, ITZ, ZMH, ZMB, HC, USNM, ZIL, IZP). Variation: Length of fore wing 4.0—6.8 mm; antennal segments 36—42; dorsal length of eye of ♀ 1.3—2.1 times temple (1.2—1.6 times in ♂); length of 1st tergite 2.1—2.4 times its apical width; length of ovipositor sheath 0.41—0.53 times fore wing; vein cu-a of fore wing antefurcal or interstitial; body colour variable, varies from completely yellowish or brownish to mainly dark brown of blackish. Cocoon whitish.

Notes. Known hosts of examined specimens belong to the Pyralidae (Lepidoptera): *Acrobasis consociella* (Hübner) and *R. formosa* (?= *Salebria formosa* Haworth) and to the Zygaenidae (Lepidoptera): *Zygaena lonicerae* (Esp.).

The application of the name *chlorophthalmus* in the Braconidae has led to a lot of confusion and misinterpretation. The name was first used by Spinola in 1808, but

the type is lost according to information kindly provided by Prof. Dr. C. Vidano and Dr. P. Passerin d'Entrèves. Luckely the original description by Spinola is comparatively clear: the petiolate metasoma, the long ovipositor (about as long as metasoma), vein m-cu of fore wing about interstitial and the size (ca. 7 mm) indicate its synonymy with *Zele chrysophthalmus* (Nees). Nees (1812: 21) clearly made a mistake by attributing the name *chrysophthalmus* to Spinola, when no such name was published by Spinola. Probably it was a miswriting of *chlorophthalmus* but actually he created a new binomen. In 1834 (p. 35) he exacerbated the situation by retaining his *chrysophthalmus* and misinterpreting *chlorophthalmus* for a species of *Homolobus* which differs by e.g., a sessile metasoma. Finally the name *chlorophthalmus* was misapplied by Haliday for what is now known as *Homolobus flagitator* (Curtis).

Zele picinervis spec. nov.
(figs. 811, 825—833)

Holotype, ♀, length of body and of fore wing both 8.9 mm.

Head. — Antennal segments 42, 3rd segment 1.2 times 4th segment, length of 3rd and 4th segments 3.7 and 3.1 times their width, respectively, length of both penultimate segments 2.0 and 2.3 times their width (fig. 832); length of maxillary palp 1.3 times height of head; dorsal length of eye 2.7 times temple; temple roundly narrowed posteriad (fig. 831); POL : ∅ ocellus : OOL = 9 : 6 : 4; frons weakly concave, mainly smooth; vertex weakly convex, punctulate; face flat, indistinctly punctulate; clypeus strongly convex (fig. 825), punctulate; length of malar space 0.1 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.3 times its height; side of pronotum densely rugulose ventrally and posteriorly, crenulate medially, punctulate dorsally (fig. 825); epicnemial area slightly punctulate-rugulose; precoxal suture widely rugose-punctate, only dorsally narrowly crenulate (fig. 825); metapleural flange large, lamelliform (fig. 825); metapleuron coarsely rugose-reticulate; notauli anteriorly narrowly crenulate, posteriorly widely crenulate-rugose (fig. 811); mesoscutal lobes densely punctulate; scutellum rather strongly convex (fig. 811, 825), without tubercle, mainly smooth; surface of propodeum coarsely carinate, anteriorly with an almost straight transverse carina, medially with a long longitudinal carina, enclosed areas weakly rugose; posterior part of propodeum not separated from antero-dorsal part (fig. 825).

Wings. — Fore wing: r : 3-SR : SR1 = 6 : 15 : 51; cu-a postfurcal, somewhat inclivous (fig. 827); 1-CU1 : 2-CU1 = 1 : 22; 2-SR : 3-SR : r-m = 13 : 15 : 9. Hind wing: r mainly absent; 1r-m weakly curved (fig. 827); length of 1-M 0.8 times cu-a.

Legs. — Hind coxa punctulate; length of femur, tibia and basitarsus of hind leg 5.9, 11.8, and 9.0 times their width, respectively.

Metasoma. — Length of 1st tergite 2.6 times its apical width, its surface smooth, except for some rugulosity behind spiracles (fig. 833); dorsal carinae of 1st tergite absent; laterope and dorsope deep and large (fig. 825, 833); 2nd tergite evenly and densely setose, bare; length of ovipositor sheath 0.24 times fore wing.

Colour. — Brownish-yellow; all trochanters and trochantelli (but apex of hind trochantellus dark brown), base of fore and middle tibiae and tarsi, apex of parastigma and pterostigma, basal quarter of pterostigma, basal two-thirds of hind tibia, its spurs and tarsus, white or nearly so; pterostigma medially, veins 1-M, cu-a, CU1, 1-SR+M, 2-SR and r of fore wing, and apical third of hind tibia, dark brown; palpi and wing membrane, slightly infuscated, but surroundings of veins 1-M, 1-CU1 and r of fore wing dark brown pigmented (fig. 827); ovipositor sheath dark brown, but apex narrowly yellowish.

Holotype in CNC, Ottawa: "Ramsey Cyn., 5000'(ft), 15 mi. S. Sierra Vista, Huachuca Mts., Ariz., Sternitzky, VIII.1968", "*Zemiotes* n. sp., W.R.M. Mason '72". Paratypes: (1♀ and 1♂); 1 ♂ (allotype, CNC), "Mex., Dgo., 24 mi. W. La Cuidad, 7000'(ft)"; 1 ♀ (RMNH), "Sn Cristobal, Chis., Mex., 27.VII.69, D. Kritsch".

Variation: Length of fore wing 8.9—11.4 mm; length of ovipositor sheath 0.19—0.24 times fore wing: length of vein 1-M of hind wing 0.8—0.9 times cu-a; length of 1st tergite 2.5—3.2 times its apical width; length of malar space 0.1 (♀) or 0.2 (♂) times its apical width.

Zele crassifemur (Muesebeck) comb. nov.
(figs. 808, 809, 834—842)

Muesebeck, 1939, Proc. ent. Soc. Wash. 41: 84 (as *Meteorus*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 63.
Mason, 1973, Proc. ent. Soc. Wash. 75: 214.

Holotype, ♀, length of body 10.3, of fore wing 9.1 mm.

Head. — Antennal segments 43, 3rd segment subequal to 4th segment, length of 3rd and 4th segments 3.0 and 3.1 times their width, respectively, length of both penultimate segments 1.7 and 1.8 times their width; length of maxillary palp 1.1 times height of head; dorsal length of eye 1.8 times temple; temple rounded posteriad, punctulate; dorsal aspect of head rather transverse (fig. 838); POL : ∅ ocellus : OOL = 11 : 6 : 7; frons rather flat, rugulose medially and punctate laterally; vertex rather flat, punctulate; face medially convex, densely punctate, rather wide (fig. 842); clypeus convex, punctate; length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; side of pronotum crenulate medially, rugulose ventrally and posteriorly; epicnemial area more or less rugose (fig. 834); precoxal suture densely and narrowly rugose-crenulate dorsally, widely and densely punctate medially and ventrally; metapleural flange large, narrowly lamelliform apically; metapleuron almost smooth dorsally, rugose-reticulate ventrally; notauli distinctly crenulate (fig. 808); mesoscutal lobes weakly punctulate; scutellum weakly convex, punctulate; surface of propodeum completely and rather coarsely reticulate, with a long medial carina; posterior part of propodeum not separated from antero-dorsal part of propodeum (fig. 834).

Wings. — Fore wing: r : 3-SR : SR1 = 11 : 21 : 91; cu-a postfurcal in right wing (fig. 836), but subinterstitial in left wing; 1-CU1 : 2-CU1 of right wing = 2 : 45; 2-

SR : 3-SR : r-m = 28 : 21 : 21; vein 2-R1 well developed, longer than r. Hind wing: r shortly developed posteriorly (fig. 836); length of 1-M 0.4 times cu-a.

Legs. — Hind coxa punctulate; length of femur, tibia and basitarsus of hind leg 4.2, 11.5, and 7.4 times their width, respectively.

Metasoma. — Length of 1st tergite 2.3 times its apical width, its surface largely smooth, apical third superficially, longitudinally striate (fig. 839); dorsal carinae of 1st tergite absent; laterope and dorsope deep and large (fig. 834, 839); 2nd tergite smooth and mainly bare; length of ovipositor sheath 0.28 times fore wing.

Colour. — Brownish-yellow; ovipositor sheath (except apex) dark brown; apical half of antenna, hind tibia dorso-apically, somewhat infuscated; all tarsi whitish; base of hind tibia and tegulae, whitish-yellow; pterostigma yellowish.

Holotype in USNM, Washington: "Wellington Kans(as)", "E. G. Kelly Collector", "Experiment 151539", "Type 53036 U.S.N.M.", "*Meteorus crassifemur* Mues., Type, Det. Muesebeck". Two paratypes were examined: 1 ♀ from Texas and 1 ♀ from Brookings, S. D., both in USNM. Additional specimens examined: (4 ♀) from Illinois (Principia College, Elsah, Jersey Co.), North Carolina (Highlands), South Dakota (Brookings, light trap), and Texas (Lost Pines Pk., Bastrop) (CNC, USNM, UZM).

Variation: Antennal segments 43—44; length of fore wing 8.8—10.1 times fore wing: length of ovipositor sheath 0.25—0.29 times fore wing; length of hind femur 3.8—4.4 times its width; 1st tergite as well as length of vein 1-M of hind wing, as in holotype.

Zele gracilis spec. nov.
(figs. 810, 843—852)

Holotype, ♀, length of body 10.6, of fore wing 9.7 mm.

Head. — Antennal segments 49, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 4.4 and 4.2 times their width, respectively, length of both penultimate segments 2.5 and 3.0 times their width; length of maxillary palp 1.5 times height of head; dorsal length of eye 2.8 times temple; temple directly narrowed posteriad (fig. 850); POL : ∅ ocellus : OOL = 13 : 11 : 4; frons mainly smooth, concave behind antennal sockets; vertex punctulate, rather flat; face rather flat, punctulate; clypeus convex, punctulate; length of malar space 0.4 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.6 times its height; side of pronotum largely coarsely and densely reticulate-punctate, medially crenulate and dorsally punctulate (fig. 843); epicnemial area coarsely punctate; precoxal suture reticulate dorsally, densely ventrally (fig. 843); rest of mesopleuron more or less punctate; metapleural flange large, lamelliform apically (fig. 843); metapleuron coarsely and finely reticulate; notauli rather shallow and narrowly crenulate (fig. 849); mesoscutal lobes densely punctulate; scutellum rather flat, punctulate; surface of propodeum densely and coarsely rugose-reticulate, only anteriorly narrowly almost smooth, medial carina only anteriorly present; posterior part of propodeum not separated from antero-dorsal part (fig. 843).

Wings. — Fore wing: r : 3-SR : SR1 = 8 : 7 : 57; cu-a postfurcal; 1-CU1 : 2-CU1 = 1 : 22; 2-SR : 3-SR : r-m = 15 : 7 : 10; 2-R1 absent. Hind wing: r weakly developed; length of 1-M 0.8 times cu-a.

Legs. — Hind coxa densely and finely punctate; length of femur, tibia and basitarsus of hind leg 7.6, 14.4, and 13.4 times their width, respectively.

Metasoma. — Length of metasoma 4.1 times its apical width, its laterobasal half smooth (fig. 843) and its surface smooth in front of spiracles, convergently striate behind spiracles (fig. 852); dorsal carinae of 1st tergite absent; laterope and dorsope deep and large (fig. 843, 852); 2nd tergite densely setose, shiny and weakly coriaceous-punctulate (fig. 852); length of ovipositor sheath 0.37 times fore wing.

Colour. — Yellowish-brown; stemmaticum, head medio-posteriorly, mesosoma, basal half of hind coxa, dark brown; apex of antenna infuscated; wing membrane light brownish; pterostigma yellowish; palpi, lower half of temples, mandibles, face, fore leg, tegulae, hind tarsus (except base and apex) and 1st tergite in front of spiracles, more or less yellowish-white; pronotum anteriorly and posteriorly, and propodeum ventrally, narrowly brownish.

Holotype in CNC, Ottawa: "Nepal, Ktmd., Pulchauki, 7300'(ft), 7—16.VIII. 1967, Mal. Tr., Can. Exp.".

Zele albiditarsus Curtis
(figs. 853—876)

Curtis, 1832, Br. Ent. 9: 415—4, figs.
Curtis, 1832, Br. Ent. 9: 415—3, fig. (*Zele testaceator*). **Syn. nov.**
Nees, 1834, Hym. Ichn. affin. Mon. 1: 34 (*Perilitus albitarsus*).
Haliday, 1835, Ent. Mag. 3: 24 (*Meteorus albitarsis*).
Wesmael, 1835, Nouv. Mém. Acad. Brux. 9: 22 (*Perilitus dispar*).
Wesmael, 1835, id. 9: 26 (*Perilitus deceptor*). **Syn. nov.**
Curtis, 1837, Guide Br. Insects: 118 (*Meteorus calcitrator*).
Cresson, 1872, Can. Ent. 4: 81 (*Perilitus pallitarsis*). **Syn. nov.**
Thomson, 1895, Opusc. ent. 20: 2149 (*Meteorus* (*Zemiotes*) *rufulus*). **Syn. nov.**
Muesebeck, 1923, Proc. U. S. natn. Mus. 63: 13 (*Meteorus maximus*). **Syn. nov.**
Muesebeck, 1923, id. 63: 14 (*Meteorus reticulatus*). **Syn. nov.**
Wagner, 1928, Verh. Ver. naturw. Unterh. Hamb. 20: 8.
Fahringer, 1930, Ark. Zool. 21A: 8 (*Meteorus romani*). **Syn. nov.**
Fischer, 1957, Opusc. zool. 3: 3 (*Meteorus* (*Zemiotes*) *separandus*). **Syn. nov.**
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 51—89.
Shenefelt, 1970, id. 5(2): 226.
Čapek, 1970, Can. Ent. 102(7): 848.
Fischer, 1970, Wiss. Arbeiten Bgld. 44: 258, 275—277, fig. 6.
Tobias, 1971, Tr. Vsesoyuzn. ent. Obshch. 54: 222—224.
Čapek, 1972, Ent. Problémy 10: 133, 138.
Mason, 1973, Proc. ent. Soc. Wash. 75: 214.
Papp, 1973, Acta Mus. Mac. Sc. nat. 14: 3.
Jakimavičius, 1974, Tr. AN Lit. SSR B2(66): 97.
Gauld & Huddleston, 1976, Entomologist's Gaz. 27: 43, fig. 19.
Van Achterberg, 1976b, Tijdschr. Ent. 119: figs. 107, 111.
Tobias, 1976, Opr. Fauna SSSR 110: 113, figs. 33: 16.

Zele albiditarsus f. deceptor (Wesmael) comb. nov.
(figs. 853—864)

Lectotype, ♀, length of body 7.5, of fore wing 6.8 mm.

Head. — Antennal segments 34, but apical segments missing, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.6 and 3.2 times their width, respectively; length of maxillary palp 1.5 times height of head; dorsal length of eye 2.2 times temple; temple roundly narrowed posteriad (fig. 863); POL : ∅ ocellus : OOL = 10 : 6 : 2; frons smooth, weakly concave; vertex weakly convex, punctulate; face rather flat, indistinctly punctulate; clypeus strongly convex, weakly punctate (figs. 853, 862); length of malar space 0.3 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.5 times its height; side of pronotum punctate-reticulate ventrally and posteriorly, crenulate medially, and mainly smooth dorsally (fig. 853); epicnemial area rugose-reticulate dorsally, narrowly crenulate anteriorly; precoxal suture crenulate dorsally, coarsely punctate-reticulate ventrally (fig. 853); rest of mesopleuron punctulate; metapleural flange large, lamelliform apically; metapleuron reticulate; notauli distinctly crenulate (fig. 861); mesoscutal lobes punctulate; scutellum weakly convex and weakly punctulate; surface of propodeum remotely and coarsely reticulate, medial carina irregular, long (fig. 864); posterior surface of propodeum not separated from antero-dorsal part (fig. 853).

Wings. — Fore wing: r : 3-SR : SR1 = 5 : 11 : 42; cu-a straight, postfurcal; 1-CU1 : 2-CU1 = 2 : 21; 2-SR : 3-SR : r-m = 14 : 11 : 8; 2-R1 short (fig. 855). Hind wing: r mainly absent; length of 1-M 0.6 times cu-a.

Legs. — Hind coxa punctulate; length of femur, tibia and basitarsus of hind leg 7.1, 13.8 and 12.2 times their width, respectively.

Metasoma. — Length of 1st tergite 2.5 times its apical width, its surface smooth in front of spiracles, longitudinally striate behind spiracles, only medially almost smooth (fig. 864); dorsal carinae of 1st tergite absent, except for a short basal remnant; laterope and dorsope large and deep (figs. 853, 864); 2nd tergite mainly bare and smooth; length of ovipositor sheath 0.27 times fore wing.

Colour. — Brownish-yellow; antenna apically and ovipositor sheath (except its tip), somewhat darkened.

Lectotype in KBIN, Brussels: "Coll. Wesmael", "1774", "*Perilitus deceptor* mihi, ♂♀, dét. C. Wesmael", "Type". Lectotype here selected, and labelled accordingly. There are two ♀ paralectotypes, both heavily damaged and two, rather dark ♂ paralectotypes.

The holotype of *Meteorus reticulatus* Muesebeck, 1923 (♀, USNM, "Mt. Wash'n", "58", "collection Ashmead", "*Meteorus areolatus* Ash., ♀, type (MS-name), "Type No. 24967 U.S.N.M.", "*Meteorus reticulatus* Mues., Type") is a typical *deceptor*.

The holotype of *Meteorus separandus* Fischer, 1957 (♂, ZSB, "Holotypus", "8/440", "Staatssamml. München, München, Pusing, 11.6.1884, leg. J. Kriechbaumer", "*Meteorus separandus* n. sp. det. Fischer, Holotype") is only a melanistic

specimen of *albiditarsus*, of which the males are usually darker than the females.

Additional specimens examined: 180 ♀ and 93 ♂. From the Nearctic region: Alaska (Gulkana Gla., from snowfield (!)), Yukon Territory (Dawson, 1100 ft), British Columbia (Andalis Cr.; Hazelton; St. Croix; 15 mi. Beatton R.; Green R.; Lakevale, Kettlevalley; Lac le Jeune; Duck Range; Lower Nicola; Kimberley; Mt. Thornhill, nr. Terrace, 700 ft; Green Inlet; Knouff L.; Jesmand; Field; mi. 103 Cariboe Hwy.; Bostock Cv.), Quebec (Parke Reserve, Kam. Co.; Covey Hill; Sept Iles; Lac Mondor, Ste Flore; Sinclair Mills; Mara; Spiller Chl.), Ontario (Gogama; Nakina; Glomcoe; Hearst; Port Arthur; Kapuskasang; Black Sturgeon Lake), Alberta (Miette Springs Rd.; Poeahontas; Hargwen; Slave L.; Jasper), Saskatchewan (Prince Albert), New Brunswick (Restigouche Co.), Nova Scotia (Truemanville, Cumberland Co.), Wisconsin (Illakee, Vitsap Co.; Trout L.), South Dakota (2 mi. S. Sylvan L., Black Hills), Virginia (Mt. Washington), Oregon (Milton Freewater; Saddleback Mt., Lincoln Co.), Utah (Aspen Grove Camp, Mt. Timpanogos, Utah Co., 6800 ft), Idaho (Cronwall), New Hampshire (Hanover; Durham), and California (Cisco).

From the Palaearctic region: Finland (Tvärmine; Pernå; Norv. b. Skiervö; Lemland; Carelia or., Soutjärva), Sweden (Lapland; Höör, Skåne), Denmark (Ems; Sonderburg; Allerup; Sondbg; Dÿrhavn), West Germany (Fuss Hohen Acht, Eiffel; Jungfernhardt, Siebengeb.; Vorgebirge, Kottenforst; Fuss Lohrberg im Siebengeb.; Mainz; Ennert nr. Beuel; Tiergarten N. Blankenheim, Eifel; München, Pusing; Bramwald, Nd. Sachsen; Hedemünden; Wiesen, Spessart; Tremalzo, Voralpen, 1300 m; Hochstadt, Obb.; Bergen, 600 m, Bayr. Alpen; Grainbach, Obbay., 700 m; Reither Alm, 1100 m; Heidelberg; Ziegenhagen, Hessen; Eberschütz, id.), England (Epping Forest, Essex; Spratton, Northants.; Isle of Rhum, Kimloch; Oxon; Goring Heath; Sherwood, NM), Scotland (Aviemore; Invern., Tollochmoor; NS., Inchnadamph), Ireland (Killykeen), Netherlands (Oostkapelle; Putten (G.); Woold; Overveen; Bentveld; Lienden; Velzen; Wijster; Rijs (Fr.); Meinweg, nr. Herkenbosch; Nunspeet; Meijendel, dunes; Rockanje, Stekelhoekduin; Oostvoorne; Drijber; Haamstede; Wapenveld; Rijsbergen; Schayk; Waarder; Wageningen, Wageningse berg; Assel; Crailo; Naardermeer; Muiderberg; Otterlo; Venlo; Heerde (G.); Asperen; Loenen; Melissant), Belgium (Lk., Stavelot), France (La Bégude de Mazenc, Drôme; Saumane de Vaucluse), Switzerland (Wallis, Unterbäch, 1500 m), Austria (Hofgastein, Schossalm, 2000—2150 m; Semmeringgeb., Reichenau dist., Salzburg, Judenbergalm; Rainberg, Steinbruch, Salzburg; Söllheim, Autobahn nr. Salzburg; Innsbruck; Gneisermoor, Salzburg; Aschbach, 1400 m, Tirol), Czechoslovakia (Prachatitz, Bohemia); USSR (Šveneioniy, Lit. SSR; Kazachstan, Karagandinsk), Bulgaria (Rodopi, Velinograd), and Italy (Campi, Riva s. Garda, 800 m; id., 220 m) (CAS, ZMH, UZM, RMNH, ITZ, CNC, ZC, ZSB, HC, ZIL, IZP).

Variation: Length of fore wing 4.5—8.3 mm; antennal segments 32—43; vein cu-a of fore wing postfurcal or seldom interstitial; length of hind femur 5.1—6.4 times its width; length of 1st tergite 2.1—2.5 times its apical width; length of ovipositor sheath 0.26—0.32 times fore wing; length of vein 1-M of hind wing 0.5—0.8 times

vein cu-a; hind tarsus yellowish, brownish, or infuscated. Silken cocoon rather tough, dense and whitish or brownish.

Known hosts of examined specimens belong to the Geometridae (Lepidoptera): *Semiothisa sexmaculata* (Packard), *S. granitata* (Guenée), *S. unipunctaria perplexa* (McDunnough), *Rheumaptera hastata* (L.), *Enypia moilietti* (?), *Eupithecia pseudotsugata* MacK., *Nyctobia nigroangulata* Strecker, and *Hydriomena furcata* (Thunberg); to the Noctuidae (*Anarta myrtilli* (L.)), Saturniidae (*Antheraea polyphemus* Cramer on *Quercus macrocarpa*), and Tortricidae (*Acleris variana* (Fernald)). The latter host especially needs to be confirmed.

Zele albiditarsus f. **pallitarsis** (Cresson) comb. nov.
(figs. 865—876)

Holotype, ♂, length of body 6.6, of fore wing 5.6 mm.

Head. — Antennal segments 43; length of maxillary palp 1.4 times height of head; dorsal length of eye 1.3 times temple; temple roundly narrowed posteriad (fig. 866); POL : ∅ ocellus : OOL = 9 : 5 : 7; length of malar space 0.7 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.4 times its height; sculpture of mesosoma as in forma *deceptor* (fig. 865).

Wings. — Fore wing: r : 3-SR : SR1 = 4 : 10 : 43; 1-CU1 : 2-CU1 = 1 : 22; 2-SR : 3-SR : r-m = 14 : 10 : 9. Hind wing: short remnant of r present; length of 1-M 0.95 times cu-a.

Legs. — Length of femur, tibia and basitarsus of hind leg 5.9, 12.2, and 8.8 times their width, respectively.

Metasoma. — Length of 1st tergite 2.4 times its apical width, its surface smooth in front of spiracles, superficially punctate-rugose posteriorly (fig. 876); 2nd tergite mainly bare and smooth.

Colour. — Brownish-yellow; pterostigma brown; hind tibia infuscated apically; palpi, two basal segments of hind tarsus, whitish, rest of hind tarsus mainly yellowish.

Holotype in ANSP, Philadelphia: "N.J.", "Type No. 1767", "*Perilitus pallitarsis* Cress.". Essentially as *deceptor*, but vein 1-M longer and hind tarsus more whitish basally. Additional specimens examined: 24 ♀ and 21 ♂. From the Nearctic region: Yukon Territory (Dawson), Newfoundland (South Branch), Michigan (Ann Arbor; Lake Odessa), Ontario (Rondeau Park; St. Pelee; Florence; Aylmer West), Quebec (Hull), Alberta (14 km N. Sundre), New York (Orient, L.I.; Ithaca), Oregon (Bedford; Hinckley), Virginia (Rosslyn), Pennsylvania (Germantown; Grantville, Dauphin Co.), Maryland (Cabin John), New Jersey (Moorestown), Maine (Bar Harbor), and Mexico (Dgo., 30 mi. W. La Cuidad, 6500 ft; Sin., 4.5 mi. W. El Palmito, 6500 ft), and from the Palaearctic region: Denmark (Sondbg.) (CNC, UZM, USNM, RMNH). One specimen was reared from *Semiothisa sexmaculata* (Packard) (Geometridae).

Variation: Length of fore wing 4.6—6.2 mm; antennal segments 39—43; length of vein 1-M of hind wing 0.9—1.3 times vein cu-a of hind wing: length of 1st tergite

2.2—2.4 times its apical width; length of ovipositor sheath 0.24—0.32 times fore wing; length of hind femur 5.9—6.6 times its width; hind tibia, pterostigma and antenna of male usually infuscated or dark brown.

Zele albiditarsus f. **albiditarsus** Curtis comb. nov.

Holotype, ♂ (from Regent's Park, England (NMV)) not examined, but the original description, especially the remark on the coloration and the figures given by Curtis are clear enough to enable a correct identification of the species. The lectotype of *Zele testaceator* Curtis on examination proved to be the ♀ of *albiditarsus*; the following redescription is based on this lectotype of *testaceator*.

Length of body 8.8, of fore wing 8.9 mm.

Head. — Antennal segments 46, 3rd segment 1.1 times 4th segment, length of 3rd and 4th segments 3.4 and 3.0 times their width, respectively, length of both penultimate segments 1.8 and 2.0 times their width; length of maxillary palp subequal to height of head; dorsal length of eye 1.7 times temple; temple roundly narrowed posteriad; POL : ∅ ocellus : OOL = 13 : 10 : 7; frons concave, somewhat rugose near antennal sockets; vertex smooth and rather convex; length of malar space 0.3 times basal width of mandible.

Mesosoma. — Length of mesosoma 1.2 times its height; sculpture of mesosoma as in *deceptor*.

Wings. — Fore wing: r : 3-SR : SR1 = 10 : 26 : 124; cu-a interstitial; 2-SR : 3-SR : r-m = 31 : 26 : 21; 2-R1 short. Hind wing: r present; 1-M much shorter than cu-a.

Legs. — Length of femur, tibia and basitarsus of hind leg 6.1, 11.0, and 9.3 times their width, respectively.

Metasoma. — Length of 1st tergite 2.0 times its apical width, anterior half very finely rugulose, basal half almost smooth; 2nd tergite mainly bare and smooth; length of ovipositor sheath 0.25 times fore wing.

Colour. — Yellowish-brown; surroundings of ocelli and ovipositor sheath (except tip), dark brown; pterostigma yellowish; hind tarsus yellowish-white.

Lectotype in NMV, Melbourne: "Coomb, 25 July" (old handwritten label, refers to the type-locality Coomb Wood, England), "Type", "3.*testaceator* Type, ♀, = 3.*albiditarsus* ♂, G. Nixon, det. 1948". This specimen is selected as lectotype, because Curtis mentioned a second locality (viz., Regent's Park), and is labelled accordingly.

The lectotype of *Perilitus dispar* Wesmael, 1835, is here selected, and labelled accordingly; it is the only well-preserved female of the type-series of *dispar*: "Coll. Wesmael", "1742", "*Perilitus dispar* mihi ♂♀, dét. C. Wesmael", "Type". Four additional paralectotypes examined: 1 ♀ and 3♂ with the same labels. Despite the small differences given by Wesmael (which are mainly due to the less accurate description of Nees) *dispar* is a junior synonym of *Perilitus albitarsus* Nees, 1834, while both are junior synonyms of *albiditarsus*.

The holotype of *Meteorus maximus* Muesebeck, 1923 (♀, USNM, "Coll", "Am. Ent. Soc. Collection", "*Zemiotes coloradensis* Ashm., ♀" (MS-name), "Type No.

24966 U.S.N.M.", "*Meteorus maximus* Mues., Type") is a typical *albiditarsus*.

The lectotype of *Meteorus rufulus* Thomson, 1895 (♂, ZIL, "p", "1977, 37") is herewith selected, and labelled accordingly. Length of fore wing 7.5 mm; hind tarsus largely whitish, basally and apically yellowish; vein cu-a of fore wing interstitial; length of 1st tergite 2.1 times its apical width, and length of hind femur 6.7 times its width. There is one paralectotype (♂, ZIL, "*rufulus*", "1977, 36"), which is also not essentially different from *albiditarsus*.

The lectotype of *Meteorus romani* Fahringer, 1930 (♀, NR, "Kamtschatka, Malaise", "1231", "Type", "*Meteorus Romani* n. sp. prope *tabidus*" (in Fahringer's handwriting), "Holotype of *Meteorus* (*Zemiotes*) *romani* Fahr., det. T. Huddleston, 1976", "403, 77". "Riksmuseum Stockholm") is here selected, and labelled accordingly. Body mainly dark brown, but eye margins mainly, antennal sockets, clypeus, mandibles, and metasoma ventro-apically, brownish; palpi and apex of ovipositor sheath, whitish-yellow; legs largely yellowish, coxae dark brown, hind femur and tibia apically brownish tinged, and hind tarsus mainly whitish; vein r of hind wing absent; length of fore wing 6.7 mm; dorsal length of eye 2.4 times temple; length of vein 1-M of hind wing 0.3 times cu-a; length of ovipositor sheath 0.21 times fore wing. A melanistic specimen of *albiditarsus*, comparable with the type of *Meteorus separandus* Fischer, but hind tarsus mainly whitish. There is one paralectotype (♂, NR, topotypic): length of fore wing 5.4 mm; hind tarsus whitish-yellow; hind femur more dark brown than in female; dorsal length of eye 1.3 times temple; length of vein 1-M of hind wing 0.85 times vein cu-a.

Additional specimens examined: 292 ♀ and 216 ♂. From the Nearctic region: Alaska (Mile, Elliott Hwy), Yukon Territory (Dawson, 1000 ft), Manitoba (Lac du Bonnet), Ontario (Pt. Pelee; Rondeau Park; Florence), New Brunswick (St. Andrew), Newfoundland (South Branch), Michigan (Gull Lake Bio. Sta., Kalamazoo Co.), New York (Orient, L.I.; Green Co., 2500 ft; Greenport; Cranberry L.), New Jersey (Ocean View, Cape May Co.), Maine (SW. Harbor), Maryland (Patuxent Ref., Cabin John), Virginia (Mountain L.), North Carolina (Highlands; Tryon), South Carolina (Clemson), Georgia (Raban Bald; Athens), Pennsylvania (Roxborough), Oregon (Saddleback Mt., Lincoln Co.), California (Camino), and Mexico (Dgo., 9000 ft, 10 mi. W. El Salto) (CNC, MSU, RMNH, UCA, USNM).

From the Palaearctic region: Finland (Taivassalo; Eckerö; Jomaba), Sweden (Sk., Dalby), Denmark (Kirksby; Adserbo; Roden-Skov, Lolland; Dÿrehavn; Wittenberge; Hus, Westgÿlland; Kôge), West Germany (Dollendorfer Hardt im Siebengeb.; Kiel; Löwenberg, Siebengeb.; Mayschoss, mittl. Ahr, nr. Bonn; Hirschwaihar im Kottenforst; Katzenlochsbachtal, nr. Bonn; Lohrberg im Siebengeb.; Geisenheim; Adenau-Hohe, Acht, Eiffel; Steinbach-Talsperre, 7 km S. Euskirchen, Rhld; Röndorfer Tal; Mühltal, nr. München; Hochstatt, nr. Rosenheim; Mittenwald, Hasel-Lähne, ca. 1700—1900 m; Seierskopf, nr. Mittenwald, ca. 1000 m; Riedbergstharte, ca. 1500 m; Titisee, Schwarzwald; Spessart, nr. Lochmühle; Hedemünden; Obbayern, nr. Gauting), East Germany (Thüringen; Berlin), USSR (K. Merija, Nida; Varénosz, Merkini, Susviesa; Kazakhstan, Balkarija; Georgiansk, Absjaro-Imerinsk, 10 km Bachmaro),

England (Herts., Arkley), Netherlands (Putten (G.); Heerde (G.); Ulvenhout; Rijs (Fr.); Muiderberg; Melissant; Oostvoorne; Driebergen; Breda; Ameland, 1 km S. Ballum; id., Nesserbosch, 1 km NE. Nes; Zundert, De Krochten; Amsterdamse Duinwaterleiding, nr. Vogelenzang; Loenen (G.); Meinweg, nr. Herkenbosch; Mon (Z.L.); Vijlen; St. Pietersberg; Bergen; Bergerbosch; Molenven (nr. Oisterwijk?); Vaals; Den Haag; Delft; 's-Graveland; Baarle-Nassau; Tegelen, De Holtmühle; Noordwijkerhout, Nieuw Leeuwenhorst; Stein; Hilversum; Amerongen; Nagele; Woold; Eerde; Garderen; Epen; Oldenzaal; Haarlemmerhout; Bussum; Beetsterzwaag; Oegstgeest, Oud-Poelgeest; Soest; Waarder; Winterswijk; Schayk; Vessem; Oploo; Venlo; Crailo; Nunspeet; Weesp; Asperen; Naardermeer; Assel; Drijber; Botshol; Bredevoort; Overveen; Ede (G.); De Steeg; Winterswijk; Wijster; Weert; Drunen; Keperbosch (Z.L.); Bergen op Zoom; Meijendel, dunes; Castelre), Belgium (Lk., Stavelot; Hautes Fagnes, Mt. Rigi, 670 m; Virton, 230 m), Austria (Leitha Geb., Donnerskirchen; Tirol, Aschbach, 1400 m; Piesting; Wien; Judenbergalm, Salzburg; id., Sam-Moos; id., Wallersee; id., Kasern; Riedegg nr. Gallneukirchen), Switzerland (Wallis), Italy (Monte Lessini, Pr. Verona, S. Rocco, 300 m), France (Pyr. or., Perpignan), Poland (Wroclaw; Gdansk), Czechoslovakia (B. Štiavnica, Slov.), China (Beh Luh Din, 30 mi N. Chengtu, Szechuan; 30 mi. N. Tatsienlu, 12000 ft, Szechuan; Mt. Omei, 6000—7500 ft, Szechuan), Japan (Nagano, 400 m; Mt. Takao, 600 m, Tokyo; Kiyose, Tokyo; Nippara, Tokyo; Mt. Asama, Nagano), Nepal (Ktmd., Godavari, 6000 ft; nr. Ktmd., Gulubhanjyang, 7500—8500 ft, pastures; Ktmd., Pulchauki, 8000 ft; 11100 ft, 27°58′N, 85°00′E; 9900 ft, 28°00′N, 85°00′E), Birma (N.E. Birma, Kambaiti, 2000 m), and India (Kalatop, 2438 m, H. P.; Dalhousie, 2133 m, H. P.; Ahla, 2286 m, H. P.) (WHC, CNC, DZD, CVR, LH, RMNH, ITZ, ZMH, IZP, ZMB, UZM, USNM, BM, HC, ZI).

Variation: Length of fore wing 4.3—11.1 mm; antennal segments 37—50; length of vein 1-M of hind wing 0.3—0.8 times vein cu-a; length of hind femur 5.9—7.1 times its width; length of 1st tergite 1.6—2.8 times its apical width; length of ovipositor sheath 0.19—0.33 times fore wing; hind tarsus white or whitish-yellow, lighter coloured than middle of hind femur; vein r of hind wing more or less developed or completely absent; specimens from China have mesoscutum and mesopleuron punctate or punctulate, but vertex at most punctulate; male has apical 0.7 of hind tibia more or less infuscated; melanistic specimens of both sexes with dark brown pterostigma, infuscated legs and body or mainly blackish body occur rather frequently; vein cu-a of fore wing postfurcal or interstitial, exceptionally antefurcal; frons and 1st tergite sculptured or almost smooth; temples of male sometimes somewhat swollen; tough silken cocoon rather greyish or almost whitish.

Known hostst of examined specimens belong to the Geometridae (*Rheumaptera hastata* (L.), *Macaria notata* (L.)), and Noctuidae (*Hypena proboscidalis* (L.), *Zale* spec.).

Notes. There has been a great deal of confusion about the identity of *testaceator*, the type-species of the genus *Zele*. Up till now it has been confused with *Homolobus* (*Phylacter*) *annulicornis* (Nees). This is surprising because Curtis figured

the metasoma (fig. 415—416) with a clearly visible laterope, far removed from the base of the tergite. This may have been overlooked because Curtis did not state explicitly that the figure was made after *testaceator*. But he explicitly stated the presence of the vein r of the hind wing for both *albiditarsus* and *testaceator*. This vein is always absent in *Homolobus annulicornis* (Nees). In my opinion Curtis was misled by the rather pronounced sexual dimorphism in *albiditarsus*; actually he named the dark male *albiditarsus* and the yellowish female *testaceator*. Already Reinhard (in Ruthe, 1862: 2) indicated the possible synonymy of *testaceator* and *albitarsus* (Nees). Additionally Bengtsson (1918: 29—32) proved that *testaceator* has to be a synonym of *albiditarsus*, without the examination of the types. Curiously he was not followed by later authors; unfortunately Bengtsson made the wrong choice for the replacement name of *Zele* auct., viz., *Phylacter* Reinhard, 1863, instead of *Homolobus* Foerster, 1862.

The variability in size and colour is very large in *albiditarsus*. This has led a large number of entomologists to naming forms structurally not or only slightly different from the nominate form. Actually on the basis of colour two main groups may be formed. The first group with more or less whitish hind tarsus includes the synonyms: *testaceator, albitarsus, dispar, calcitrator, pallitarsis, rufulus, maximus,* and *romani* (the last mentioned being the melanistic form). The second has the hind tarsus more or less brownish or yellowish and includes the synonyms *deceptor, reticulatus,* and *separandus* (the last mentioned being the melanistic form of this group). The body colour varies from completely yellowish to completely blackish; the latter colour is very common in Nepal. The males are usually more infuscated than the females. I have tried hard to split up the complex, but all efforts were unsuccessful. For instance, the shape of the mesoscutum anteriorly, the length of the fore wing, the number of antennal segments and the index of the length of vein 1-M and vein cu-a of hind wing could not be reliably applied. Also the hosts of the various forms are, at least partly, the same; the difference in size of the hosts may account for the more than 100% difference in size between small and large specimens; smaller specimens have also smaller numbers of antennal segments. However, large difference in size is a not uncommon phenomenon among the parasitic Hymenoptera if various host-species are attacked which differ considerably in size.

EXCLUDED SPECIES

Austrozele assamensis (Cameron) comb. nov.

Cameron, 1910, Tijdschr. Ent. 53: 53 (as *Zele*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 153.

This species will be treated in a proposed revision of the Macrocentrinae.

Macrocentrus bengtssoni (Fahringer) comb. nov.

Fahringer, 1930, Ark. Zool. 21A(8): 5 (as *Phylacter*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 221.

The illustrated redescription will be published in a revision of the Macrocentrinae.

Meteorus brunnipes Ruthe

Ruthe, 1862, Berl. ent. Z. 6: 37.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 55.
Fischer, 1970, Wiss. Arbeiten Bgld. 44: 275.

Fischer (1970: 275) has given *brunnipes* as a synonym of his *Meteorus deceptor* (Wesmael) without giving a justification of this synonymy. Fortunately Mr. T. Huddleston (London), who examined the lectotype, kindly informed me that this species is a true *Meteorus* and is not related to *deceptor*.

Meteorus dubius Ruthe

Ruthe, 1862, Berl. ent. Z. 6: 27, 28.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 65.
Fischer, 1970, Wiss. Arbeiten Bgld. 44: 258.

Fischer (1970: 258), in his key to the *Meteorus* species, has given *dubius* as a synonym of *Zele caligatus* (Haliday), without any additional information. Again Mr. T. Huddleston was kind enough to inform me (after examination of the holotype) that *dubius* is not closely related to *caligatus*, and has to be referred to the genus *Meteorus* s.s.

Macrocentrus dubius (Wesmael) comb. nov.

Wesmael, 1835, Nouv. Mém. Acad. Brux. 9: 168 (as *Eubadizon*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 223.

Traditionally this species is considered to be related to *Charmon extensor* (L.), but examination of the holotype revealed its true nature. The illustrated redescription will be published in a revision of the Macrocentrinae.

Austrozele filicornis (Cameron) comb. nov.

Cameron, 1903, J. Straits Brch R. Asiat. Soc. 39: 128 (as *Zele*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 153.

See note under *Austrozele assamensis* (Cameron).

Eubazus longicaudus (Curtis) comb. nov.

Curtis, 1832, Br. Ent. 9: 415—10 (as *Zele longicauda*).
Shenefelt, 1970, Hym. Cat. 5(2): 224.

The examination of the holotype (NMV, Melbourne, which is not a lectotype as suggested by Shenefelt (1970: 224), because there is only one type-specimen in the

Curtis Collection and Curtis did not indicate that he had more than one specimen at hand) reveals that it belongs to the genus *Eubazus* Nees (Helconinae, Brachistini). However, there it becomes the senior homonym of *Eubazus longicaudis* (Ratzeburg, 1844). Therefore, I have to rename *E. longicaudis* (Ratzeburg, 1844). I call it *E. denticulatus* nom. nov., because of its small clypeal tooth.

Austrozele maculiceps (Cameron) comb. nov.

Cameron, 1912, Annls Soc. ent. Belg. 56: 372 (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 224.

Examination of the holotype (MAC, Tervuren) shows its relationship to the Macrocentrinae and particularly the genus *Austrozele* Roman. It will be dealt with in a revision of the Macrocentrinae.

Hymenochaonia melanonotus (Cameron) comb. nov.

Cameron, 1911, Timehri 1: 317 (as *Zele*).
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 225.

Examination of the holotype (BM, London) reveals that it belongs to the genus *Hymenochaonia* Dalla Torre and it will be dealt with in a revision of the subfamily Macrocentrinae.

Phylax nigricornis Walker

Walker, 1871, List Hym. Egypt. Arab.: 5.
Shenefelt, 1970, Hym. Cat. (nov. ed.) 5(2): 225.

Repeatedly Mr. T. Huddleston has searched, without success, for the type of *nigricornis*, while it should be in BM, London. Therefore the type is considered to be lost. Unfortunately the original description is too vague to be certain about its identity. The colour of the hind leg and antenna exclude it from the known Afrotropical and South Palaearctic species of *Homolobus*. If the note about the "thick" antenna is taken not too literally and if *Austrozele longipes* (Holmgren) occurs in Eritrea (where *Phylax nigricornis* was captured), it may well be this species which belongs to the Macrocentrinae. Until more is known about the fauna of Eritrea, the synonymy of *nigricornis* with *longipes* remains uncertain. The interpretation by Szépligeti of *nigricornis* is incorrect and refers to several species of the subgenus *Apatia* of the genus *Homolobus*.

Meteorus pallidus (Nees)

Nees, (1811)1812, Mag. Ges. nat. Fr. Berl. 5: 22 (as *Bracon*).
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 84.
Fischer, 1970, Wiss. Arbeiten Bgld. 44: 258.

Fischer (1970: 258) has added *M. pallidus* (Nees) to his *Zemiotes* section, in this paper treated as the genus *Zele* Curtis. But Nees stated explicitly that the 1st tergite of metasoma has the dorsope absent ("abdominus segmentum petiolare elongato-obconicum, punctulatum, nec sulcatum;....."), while all Palaearctic species of *Zele* have large and easily visible dorsope (or sulcate petiolar segment in the words of Nees). Another indication of the misinterpretation of *pallidus* is the sculpture of the 1st tergite; in *pallidus* sensu Fischer it is striate or rugose, while Nees calls it punctulate. Therefore I exclude *pallidus* from *Zele* Curtis and include it in *Meteorus* Haliday s.s. This leaves *pallidus* sensu Fischer without a name, but in my opinion it is only a rather robust form of *Zele albiditarsus* Curtis.

Zele somaliensis Szépligeti

Szépligeti, 1914, Mitt. zool. Mus. Berl. 7: 223.
Shenefelt, 1969, Hym. Cat. (nov. ed.) 4(1): 170.

Examination of the holotype (ZMB, Berlin) reveals its relationship to a new genus near *Austrozele* in the Macrocentrinae. The illustrated redescription will be published in a revision of the Macrocentrinae.

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LITERATURE

For references not included, see Shenefelt, 1965.

Achterberg, C. van, 1974a. A redescription of *Idiasta theodori* Van Vollenhoven, 1878 (Hym., Braconidae). — Zool. Meded. Leiden 48(4): 23—27, figs. 1—6.

———, 1974b. Some Braconidae (Hym.) new to Norway. — Norsk ent. Tidskr. 21(1): 110.

———, 1974c. The features of the petiolar segment in some Braconidae (Hym.). — Ent. Ber., Amst. 34: 213—214, figs. 1—4.

———, 1976a. A revision of the tribus Blacini (Hym., Braconidae, Helconinae). — Tijdschr. Ent. 118(7): 159—322, figs. 1—476, 2 tables.

———, 1976b. A preliminary key to the subfamilies of the Braconidae (Hym.). — Tijdschr. Ent. 119(3): 33—78.

Allen, A. A., 1977. Exhibits. — Proc. Brit. ent. nat. hist. Soc. : 111—112.

Bengtsson, S., 1918. Braconologische Beiträge. II. Revision der europäischen Arten der Gattung *Phylacter* Thomson. — Acta Univ. lund. (2)14(32): 29—47, figs. 16—19.

Brothers, D. J., 1975. Phylogeny and classification of the aculeate Hymenoptera, with special reference to Mutillidae. — Univ. Kansas Sci. Bull. 50(11): 483—648, figs. 1—101, tables 1—7.

Cavro, E., 1954. Catalogue des Hyménoptères du Département du Nord et régions limitrophes. Térébrants, 3. — Suppl. Bull. Soc. ent. N. Fr. 75: 1—134.

Čapek, M., 1969. An attempt at a natural classification of the family Braconidae based on various unconventional characters (Hym.). — Proc. ent. Soc. Wash. 71(3): 304—312.

———, 1970. A new classification of the Braconidae (Hym.) based on the cephalic structures of the final instar larvae and biological evidence. — Can. Ent. 102(7): 846—875, figs. 1—58.

———, 1972. List of parasites bred from injurious insects, 5. Braconidae (Hym.). — Ent. Problémy 10: 125—140.

———, 1973. Key to the final instar larvae of the Braconidae (Hym.). — Acta Inst. forest. zvol.: 259—268, 1 fig.

———, 1975. Contribution to the knowledge of some remarkable species of Braconidae (Hym., Braconidae). — Biológia (Bratislava) 30: 815—820.

Curtis, J., 1832. Hymenoptera. — Br. Ent. 9.

Eady, R. D., 1974. The present state of nomenclature of wing venation in the Braconidae (Hym.); its origins and comparison with related groups. — J. Ent. (B)43(1): 63—74, figs. 1—10.

Fischer, M., 1970. Die *Meteorus*-Arten des Burgenlandes (Hym., Braconidae, Euphorinae). — Wiss. Arbeiten Bgld. 44: 254—300, figs. 1—12.

Fitton, M. G., 1978. The species of "Ichneumon" (Hymenoptera) described by Linnaeus. — Biol. J. Linn. Soc. 10: 361—383.

Gauld, I. D. & T. Huddleston, 1976. The nocturnal Ichneumonoidea of the British Isles, including a key to the genera. — Entomologist's Gaz. 27: 35—49, figs. 1—20.

Jakimavičius, A. B., 1974. Species of braconids new for the fauna of the Lithuanian SSR (Hym., Braconidae). — Tr. AN Lit. SSR B2(66): 93—102.

———, 1976. Composition and zoogeographical distribution of braconids (Hym., Braconidae) of the Lithuanian SSR and their relation with hosts. 3. Ectoparasite and some endoparasite hosts. — Tr. AN Lit. SSR B2(74): 87—99.

Jong, R. de, 1976. Affinities between West Palaearctic and Ethiopian butterfly faunas. — Tijdschr. Ent. 119: 165—215.

Kabašinskaite, M. & A. B. Jakimavičius, 1973. The pests of fruit-trees in the Lithuanian SSR and their parasites. — Acta ent. Lituanica 2: 75—90.

Königsmann, E., 1976. Das phylogenetische System der Hymeoptera/Teil 1: Einführung, Grundplanmerkmale, Schwestergruppe, und Fossilfunde. — Dtsch. Ent. Z. (N.F.) 23: 253—279, figs. 1—4.

———, 1977. Id. Teil 2: "Symphyta". — Dtsch. Ent. Z. (N.F.) 24: 1—40, figs. 1—6.

———, 1978. Id. Teil 3: "Terebrantes" (Unterordnung Apocrita). — Dtsch. Ent. Z. (N.F.) 25: 1—55, figs. 1—7.

Marsh, P. M., 1971. Keys to the Nearctic genera of the families Braconidae, Aphidiidae and Hybrizontidae (Hym.). — Ann. ent. Soc. Am. 64: 841—850, figs. 1—11.

Mason, W. R. M., 1973. Recognition of *Zemiotes* (Hym., Braconidae). — Proc. ent. Soc. Wash. 75(2): 213—215.

———, 1974. A generic synopsis of Brachistini (Hym., Braconidae) and recognition of the name *Charmon* Haliday. — Proc. ent. Soc. Wash. 76(3): 235—246, figs. 1,2.

Michener, C. D., 1944. Comparative external morphology, phylogeny, and a classification of the bees (Hym.). — Bull. Am. Mus. nat. Hist. 82: 151—326, figs. 1—246.

Muesebeck, C. F. W. & L. M. Walkley, 1951. Braconidae. In: C. F. W. Muesebeck, K. V. Krombein & H. K. Townes. Hymenoptera of America north of Mexico. Synoptic Catalog. — Agriculture Monograph 2: 90—184. Washington.

Nees von Esenbeck, C. G., 1812. Ichneumonides adsciti, in genera et familias divisi. — Mag. Ges. Naturf. Fr. Berlin 5: 3—37.

———, 1834. Hymenopterorum Ichneumonibus affinium monographiae, genera Europaea et species illustrantes 1: 1—320. — Cottae, Stuttgartiae et Tubingae.

Nixon, G. E. J., 1938. Notes on the taxonomy and synonymy of *Zele* Curtis and *Macrocentrus* Curtis

(Hym., Braconidae). — Bull. ent. Res. 29: 415—424.

Papp, J., 1970. A contribution to the braconid fauna of Israel (Hym.). — Israel J. ent. 5: 63—76, figs. 1—3.

———, 1971. Results of the Zoological Explorations of Dr. Z. Kaszab in Mongolia (Hym., Braconidae) II. — Acta zool. Acad. sc. hung. 17(1—2): 51—91, figs. 1—59.

———, 1973. Contributions to the braconid fauna of Yugoslavia (Hym., Braconidae). — Acta Mus. Mac. sc. nat. 14(1): 1—23, figs. 1—5.

———, 1974. A study on the systematics of Braconidae (Hym.). — Folia ent. hung. (n.s.) 27(2): 109—133, fig. 1.

Richards, O. W., 1956. Hymenoptera. Introduction and key to families. — Handb. Ident. Brit. Insects 6(1): 1—94, 127 + 22 figs.

———, 1977. Id., 2nd ed.: 1—100, 196 + 22 figs.

Riegel, G. T., 1948. The wings of Braconidae (Hym.). — Ann. ent. Soc. Am. 41(4): 439—449, figs. 1—39.

Ross, H. H., 1937. A generic classification of the Nearctic sawflies (Hym., Symphyta). — Ill. biol. Monogr. 25: 1—173, figs. 1—424.

Ruthe, J. F., 1862. Deutsche Braconiden, 3. — Berl. ent. Z. 6: 1—58.

Shenefelt, R. D., 1965. A contribution towards knowledge of the world literature regarding Braconidae (Hym., Braconidae). — Beitr. Ent. 15(3—4): 243—500.

———, 1969. Hymenopterorum Catalogus (nov. ed.). Part 4. Braconidae 1: 1—176. — Junk, 's-Gravenhage.

———, 1970. Id. Part 5. Braconidae 2: 177—306. — Junk, 's-Gravenhage.

Sigwalt, B., 1977. La nomenclature alaire de Comstock-Needham dans l'étude des Braconides: distinction des genres *Phanerotoma* et *Phanerotomella* (Hym., Braconidae, Cheloninae). — Annls Soc. ent. Fr. (N.S.) 13(3): 525—534, figs. 1—6.

Tobias, V. I., 1971. Review of the Braconidae (Hym.) of the USSR. — Tr. Vsesoyuzn. ent. Obshch. 54: 156—268, figs. 1—112 (Russian).

———, 1976. Braconids of the Caucasus (Hym., Braconidae). — Opr. Fauna SSSR 110: 1—287, figs. 1—67 (Russian).

Toxopeus, L. J., 1940. Nederlandsch-Indisch Amerikaansche Expeditie naar Nederlandsch Nieuw-Guinea (3e Archbold-Expeditie naar Nieuw-Guinea 1938—1939). Lijst van verzamelstations. — Treubia 17: 271—279, 1 map.

Wagner, A. C. W., 1928. Schlupfwespen und ihre Wirte. — Verh. Ver. naturw. Unterh. Hamb. 20: 1—17.

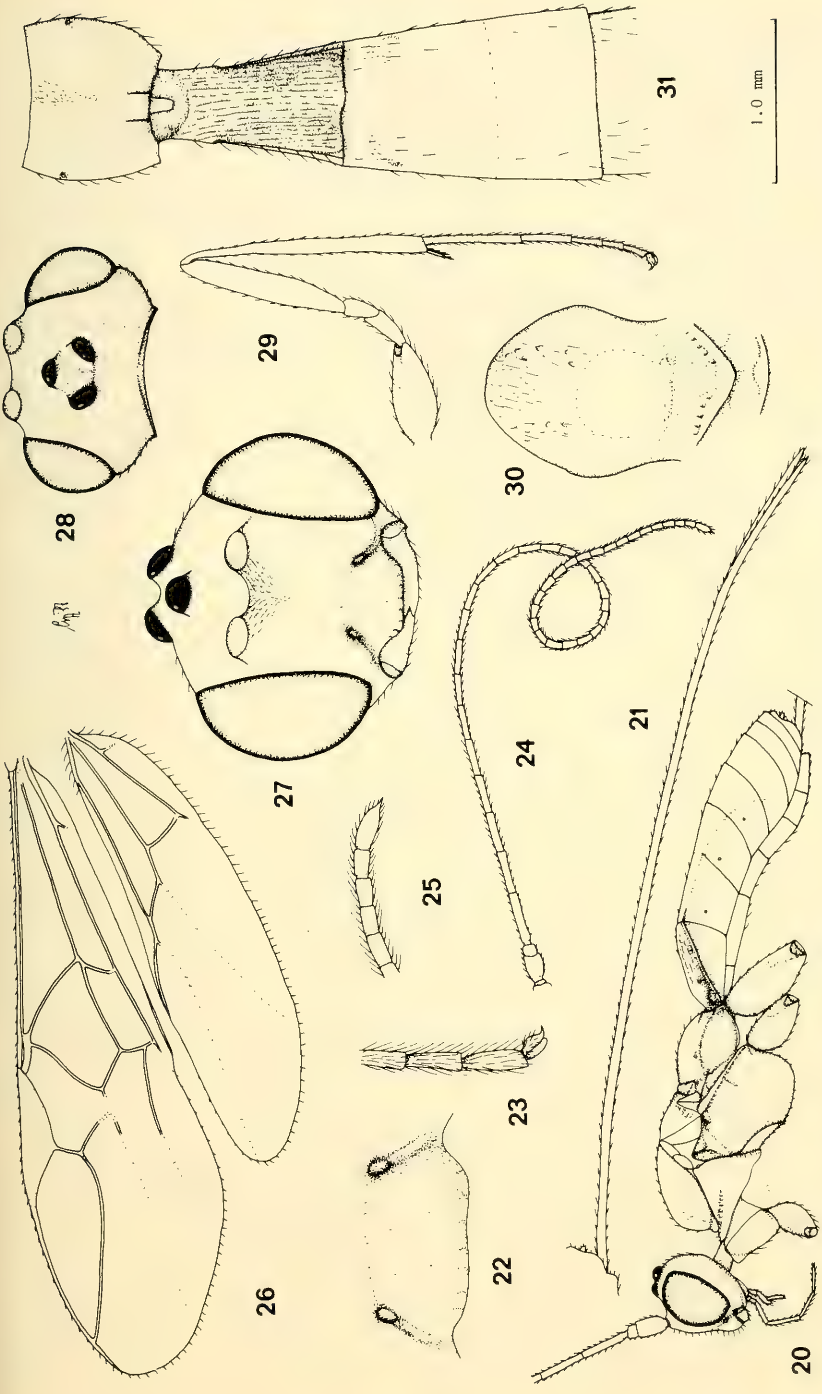
Watanabe, C., 1969. Notes on the genera *Zele* Curtis and *Xiphozele* Cameron, with special reference to the species in Japan (Hym., Braconidae). — Proc. ent. Soc. Wash. 71(3): 318—328, figs. 1—9.

Wesmael, C., 1835. Monographie des Braconides de Belgique. — Nouv. Mém. Acad. sci. R. Bruxelles 9: 1—252.

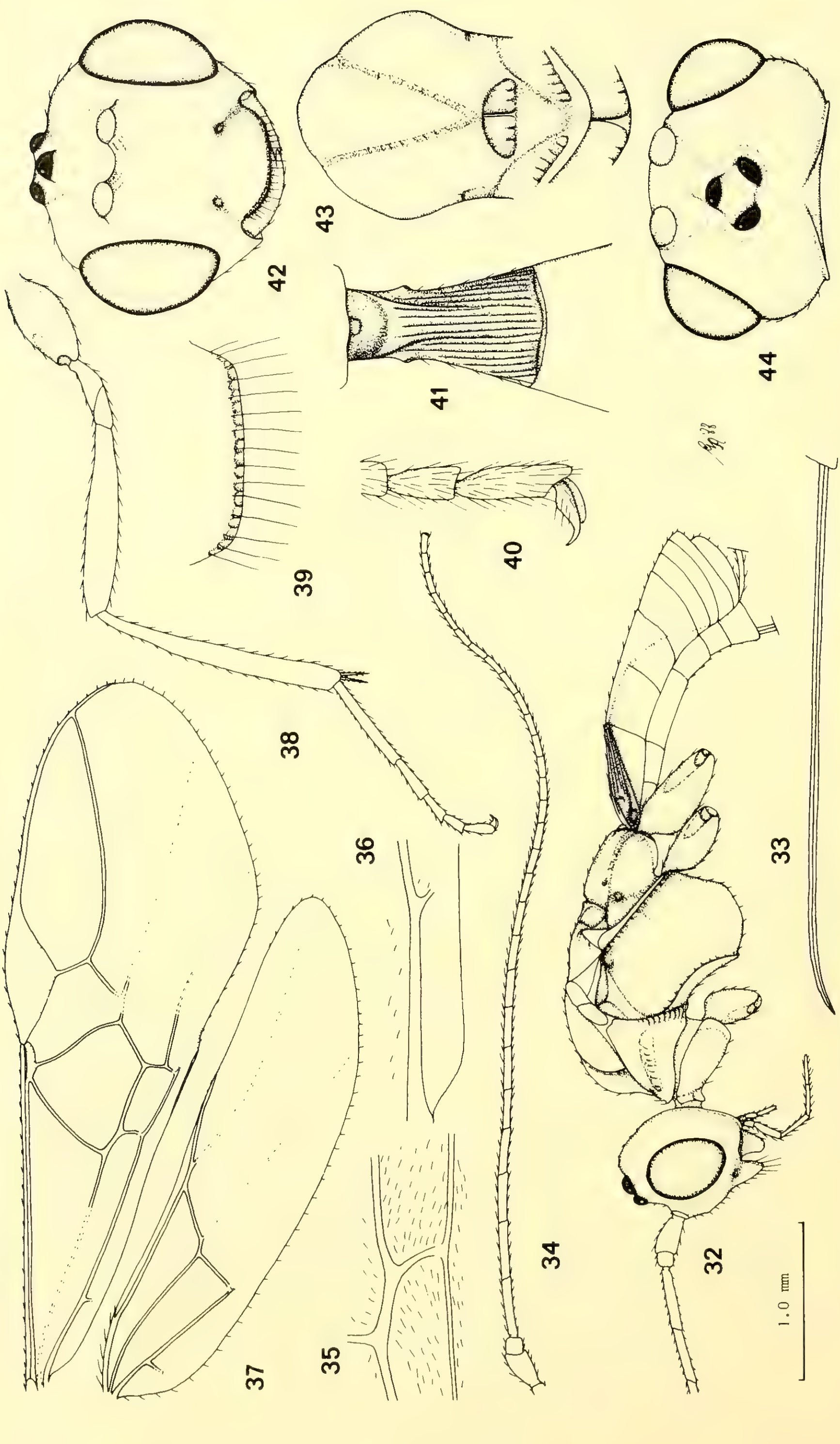
INDEX OF NAMES USED IN THE GENERA *Charmon, Exasticolus, Homolobus, Zele* AND THEIR SYNONYMS

ephippium Curtis, 1832	*Zele*	*Meteorus*	England, NMV	
ethiopicus spec. nov.	*Homolobus*	*Homolobus*	Tanzania, CNC	318
extensor Linnaeus, 1758	*Ichneumon*	*Charmon*	Sweden, BM	265
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flagitator Curtis, 1837	*Helcon*	*Homolobus*	Ireland, ?lost	334
(nom. nov. for *chlorophthalmus* Haliday, 1836, nec Spinola, 1808)				
fulvifrons Curtis, 1832	Nom. nudum			
fuscicornis Cameron, 1887	*Zele*	*Exasticolus*	Guatemala, BM	273
fuscitarsis Bengtsson, 1918	*Phylacter*	*Homolobus*	Sweden, ZIL	285
geminator Lyle, 1914	Nom. nov. for *chlorophthalmus* Haliday, 1836, nec Spinola, 1808			334
gracilis Provancher, 1880	*Eubadizon*	*Charmon*	?Quebec, PC	265
gracilis Provancher, 1886	*Phylax*	*Bracon*	Quebec, PC	
gracilis spec. nov.	*Zele*	*Zele*	Nepal, CNC	375
huddlestoni spec. nov.	*Homolobus*	*Homolobus*	Tanzania, BM	297
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inopinus spec. nov.	*Homolobus*	*Homolobus*	Malagasy, MNHN	316
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melanonotus Cameron, 1911	*Zele*	*Hymenochaonia*	Guyana, BM	385
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meridionalis spec. nov.	*Homolobus*	*Homolobus*	Marocco, CNC	326
mesoxiphius spec. nov.	*Homolobus*	*Homolobus*	Arizona, CNC	346
neesii Ruthe, 1862	*Meteorus*	*Zele*	Germany, BM	364
nepalensis spec. nov.	*Homolobus*	*Homolobus*	Nepal, CNC	340
niger Provancher, 1885	*Phylax*	*Doryctes*	British Columbia, PC	
nigriceps Riley & Howard, 1890	Nom. nudum			
nigriceps Enderlein, 1920	*Zele*	*Exasticolus*	Mexico, PAN	275
nigricollis Thomson, 1895	*Meteorus*	*Zele*	Sweden, ZIL	370
nigricornis Walker, 1871	*Phylax*	?(excluded)	Ethiopia, lost	385
nigritarsis spec. nov.	*Homolobus*	*Homolobus*	New Guinea, RMNH	310
nipponensis spec. nov.	*Homolobus*	*Homolobus*	Japan, EI	338
niveitarsis Cresson, 1872	*Perilitus*	*Zele*	Massachusetts, ANSP	368
nudator Thunberg, 1822	*Ichneumon*	*Zele*	Sweden, Uppsala	370
obscurus spec. nov.	*Homolobus*	*Homolobus*	Brazil, TC	344
occidentalis spec. nov.	*Homolobus*	*Homolobus*	Bolivia, TC	337
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ophioninus Vachal, 1907	*Meteorus*	*Homolobus*	New Caledonia, MNHN ..	298
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pallitarsis Cresson, 1872	*Perilitus*	*Zele*	New Jersey, ANSP	376
palliventris Provancher, 1880	*Phylax*	*Bracon*	?, PC	
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pectoralis Nees, 1834	*Eubadizon*	*Charmon*	Germany, lost (neotype: KBIN)	268
peronatus Shestakov, 1940	*Meteorus*	*Zele*	USSR, NR	368

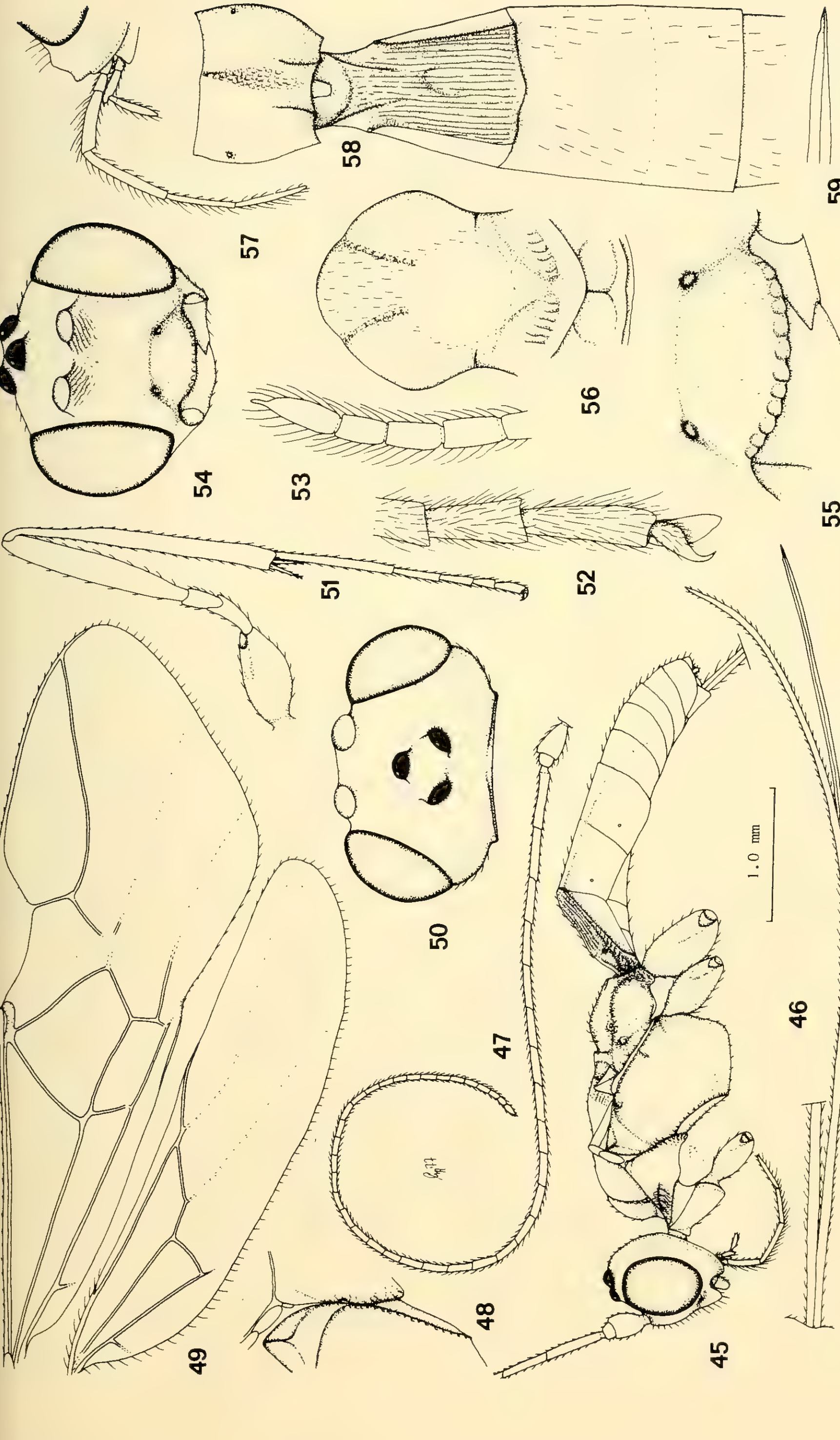
picinervis spec. nov.	*Zele*	*Zele*	Arizona, CNC	373
pleuralis Cresson, 1872	*Eubadizon*	*Charmon*	Missouri, ANSP	268
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pulchricornis Nixon, 1938	*Zele*	*Homolobus*	S. Africa, BM	296
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rectinervis spec. nov.	*Homolobus*	*Homolobus*	Chile, CNC	348
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thoracicus Curtis, 1832	*Zele*	*Meteorus*	England, NMV	
truncatoides spec. nov.	*Homolobus*	*Homolobus*	Egypt, ZMB	300
truncator Say, 1828	*Bracon*	*Homolobus*	Indiana, lost (neotype: RMHN)	285
tuberculatus spec. nov.	*Exasticolus*	*Exasticolus*	Brazil, TC	272
tuberculifer spec. nov.	*Zele*	*Zele*	Panama, RMNH	368
undulatus spec. nov.	*Homolobus*	*Homolobus*	New Guinea, RMNH	309
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wesmaeli Bengtsson, 1918	*Phylacter*	*Homolobus*	Belgium, KBIN	305



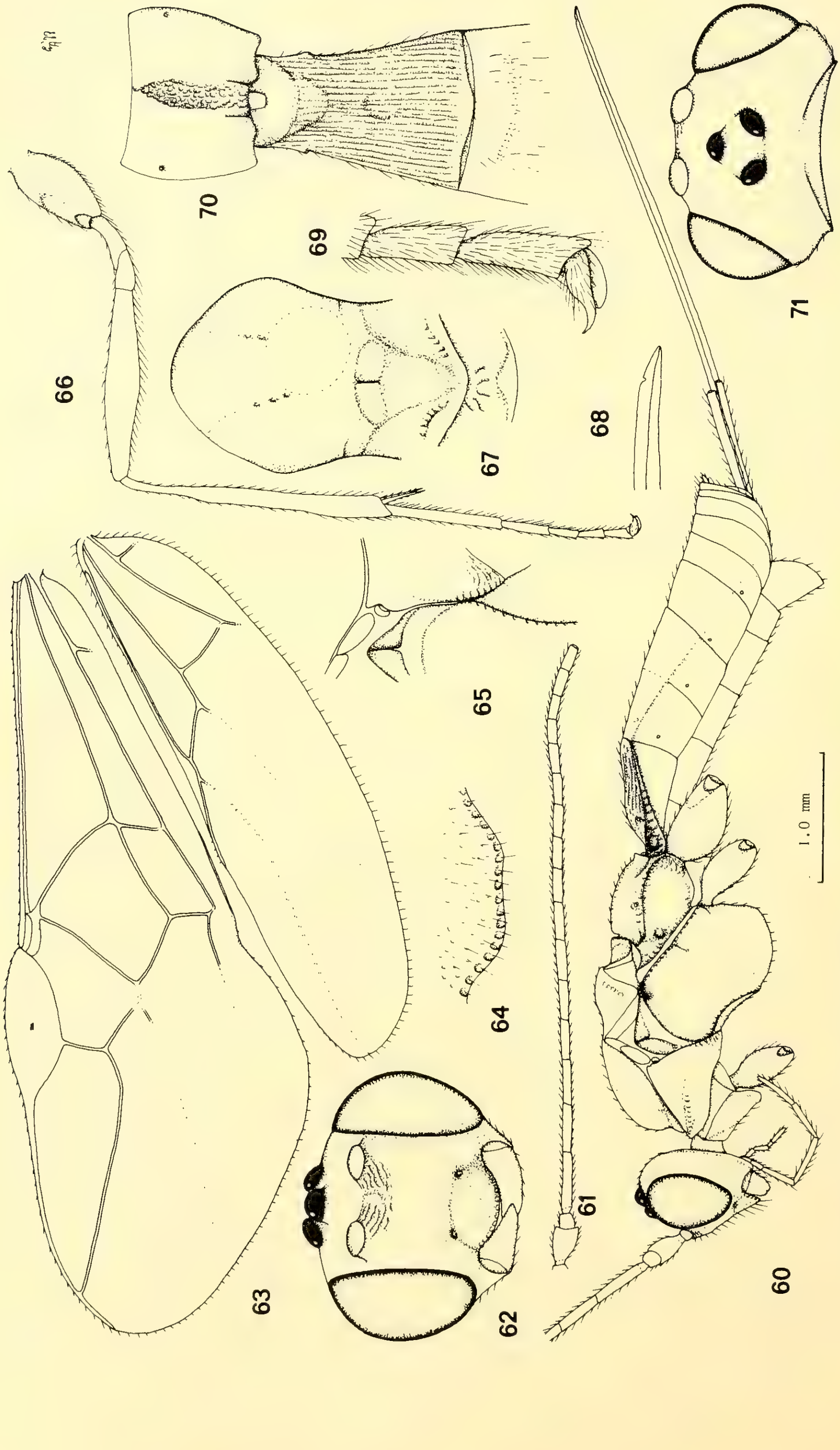
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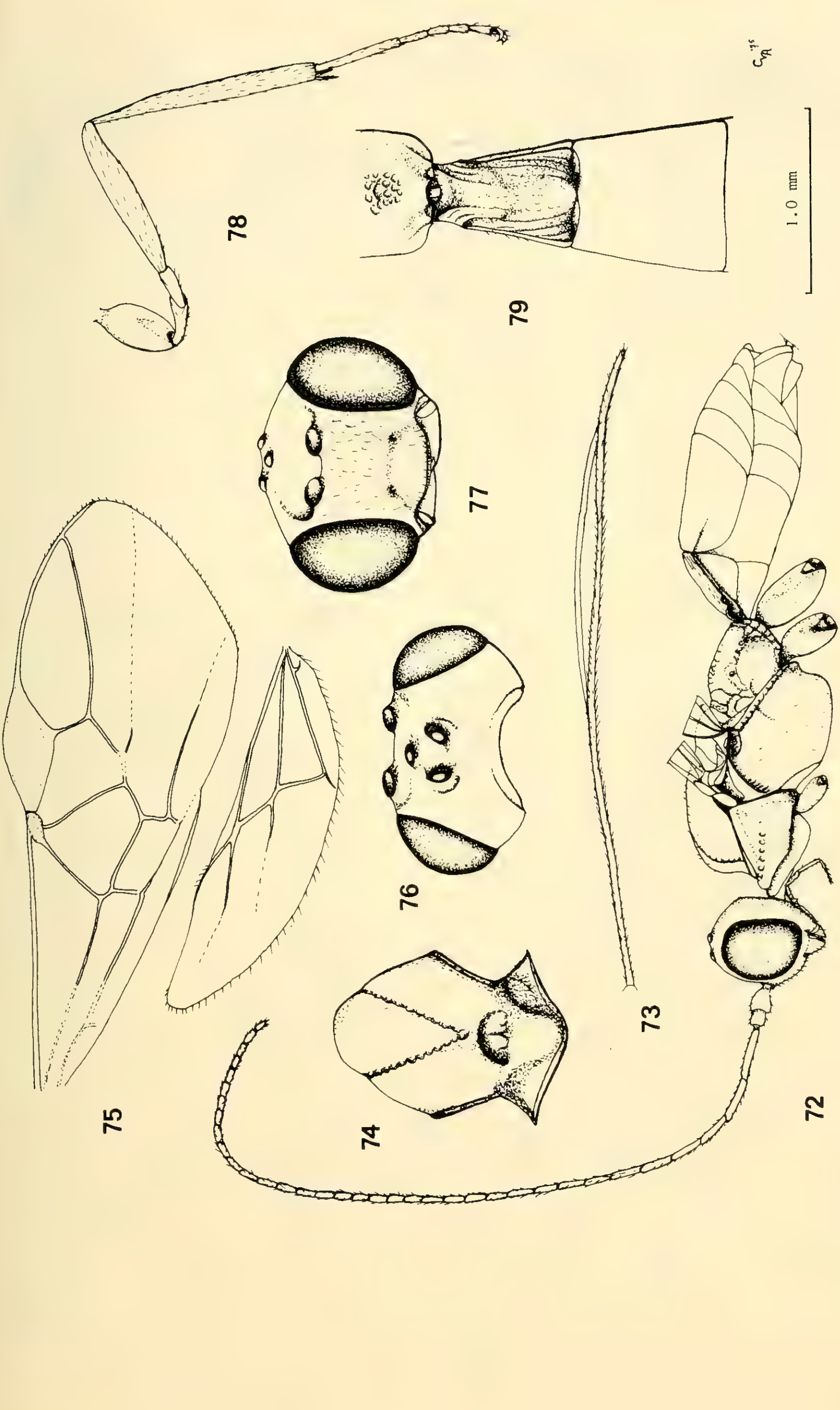
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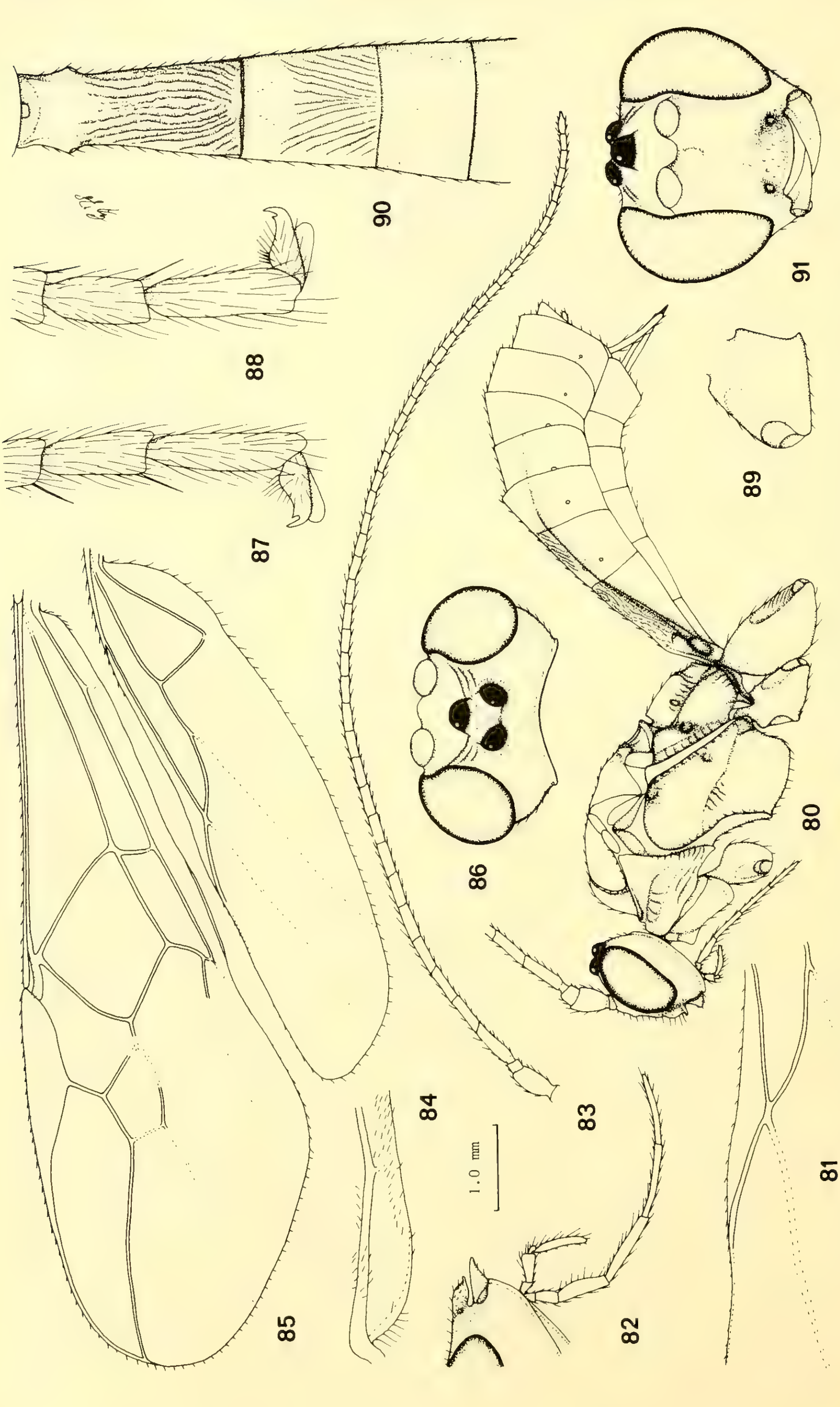
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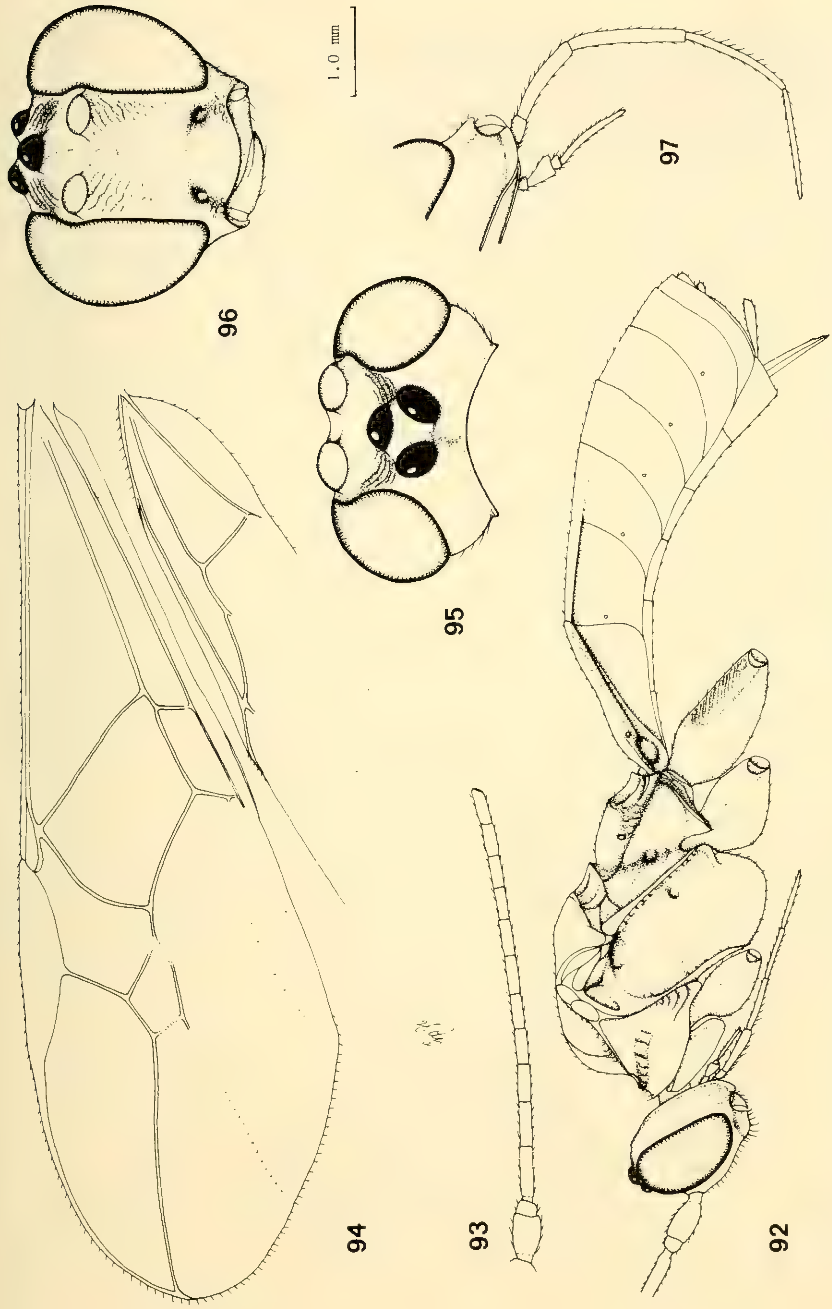
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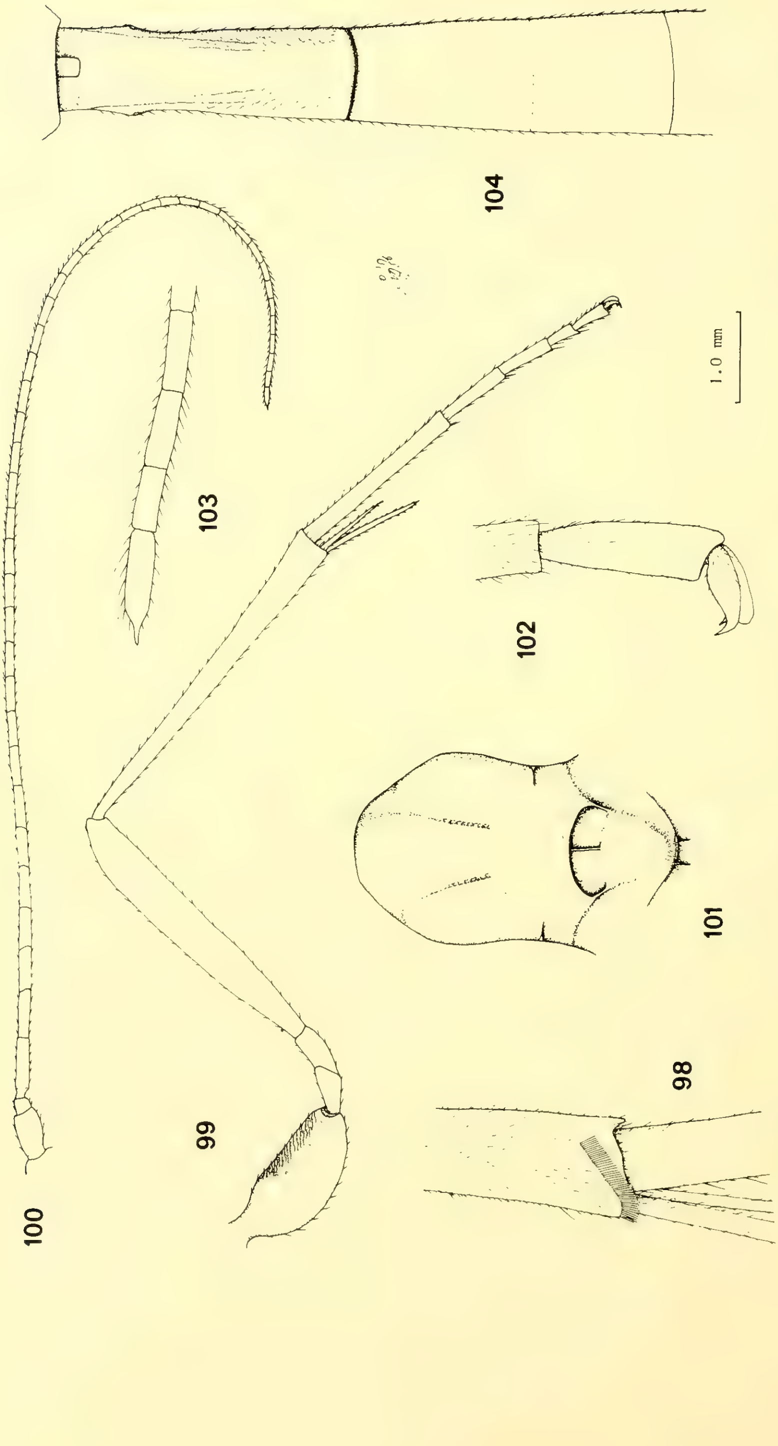
Figs. 72—79, *Charmon luteus* (Cameron), holotype. 72, habitus, lateral aspect; 73, ovipositor; 74, mesonotum, dorsal aspect; 75, wings; 76, head, dorsal aspect; 77, head, frontal aspect; 78, hind leg; 79, propodeum and 1st—2nd tergites, dorsal aspect. 72, 73, 75, 78: scale-line, 1 ×; 74—77, 79: 1.5 ×



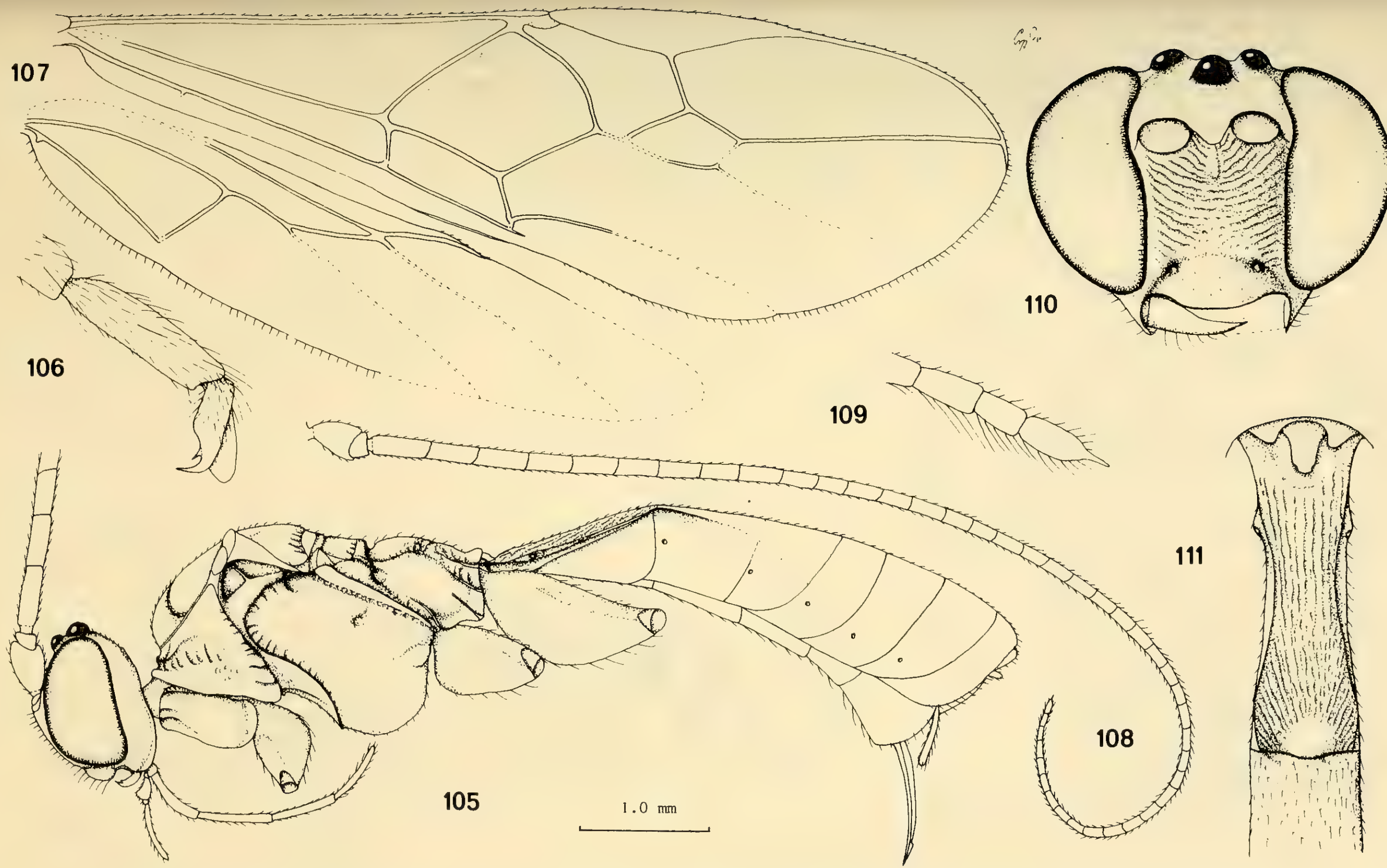
Figs. 80—91, *Exasticolus tuberculatus* spec. nov., holotype. 80, habitus, lateral aspect; 81, detail of vein SC + R1 of hind wing; 82, palpi; 83, antenna; 84, detail of veins 1A + 2A and 2A of fore wing; 85, wings; 86, head, dorsal aspect; 87, inner hind claw; 88, outer hind claw; 89, detail of middle coxa, dorso-lateral aspect; 90, 1st—3rd tergites, dorsal aspect; 91, head, frontal aspect. 80, 83, 85: scale-line, 1 ×; 81, 82, 84, 86, 89—91: 2.0 ×; 87, 88: 5.0 ×



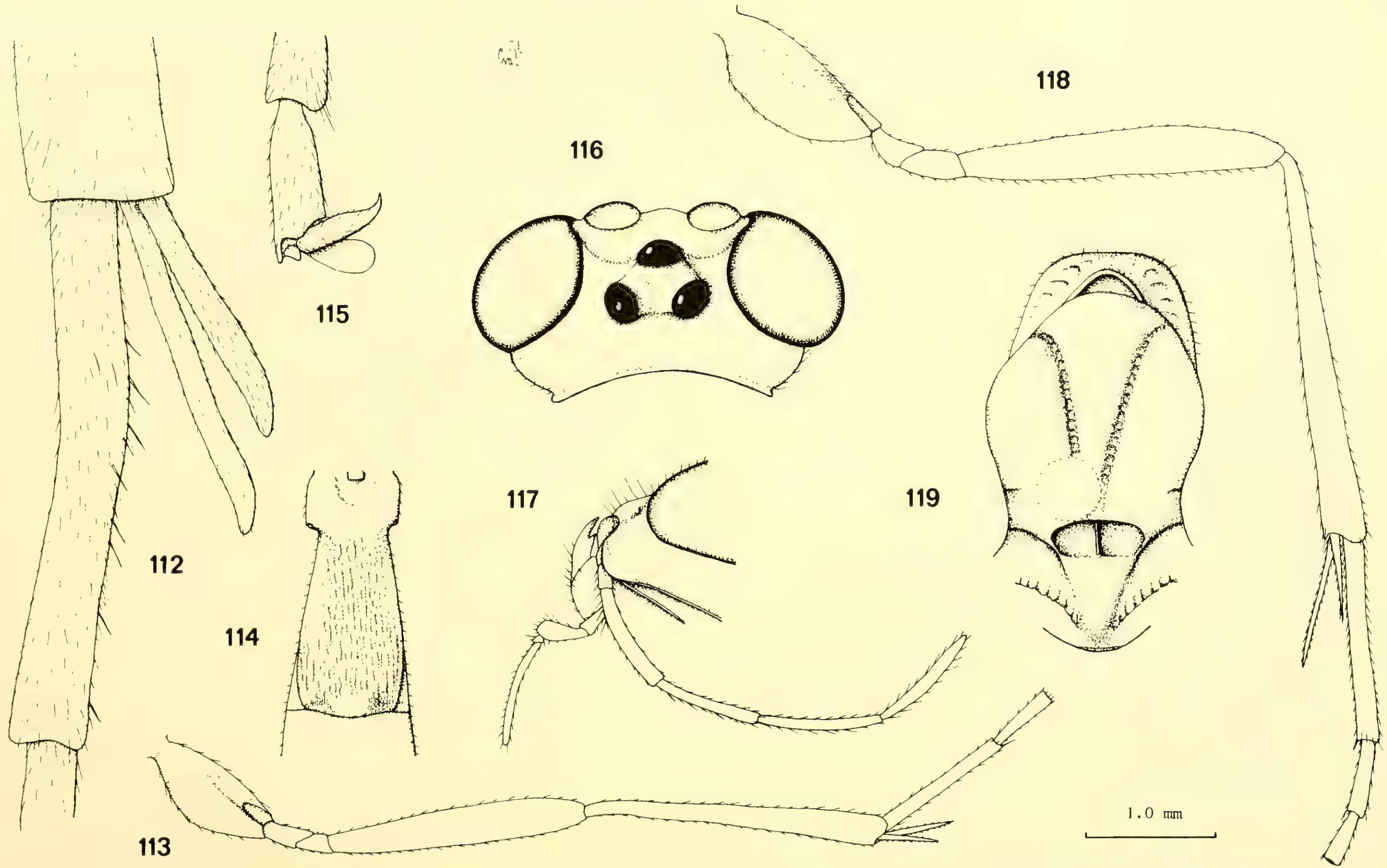
Figs. 92—97, *Exasticolus fuscicornis* (Cameron), holotype. 92, habitus, lateral aspect; 93, antenna; 94, wings; 95, head, dorsal aspect; 96, head, frontal aspect; 97, palpi. 92—94: scale-line, 1 ×; 95—97: 2.0 ×



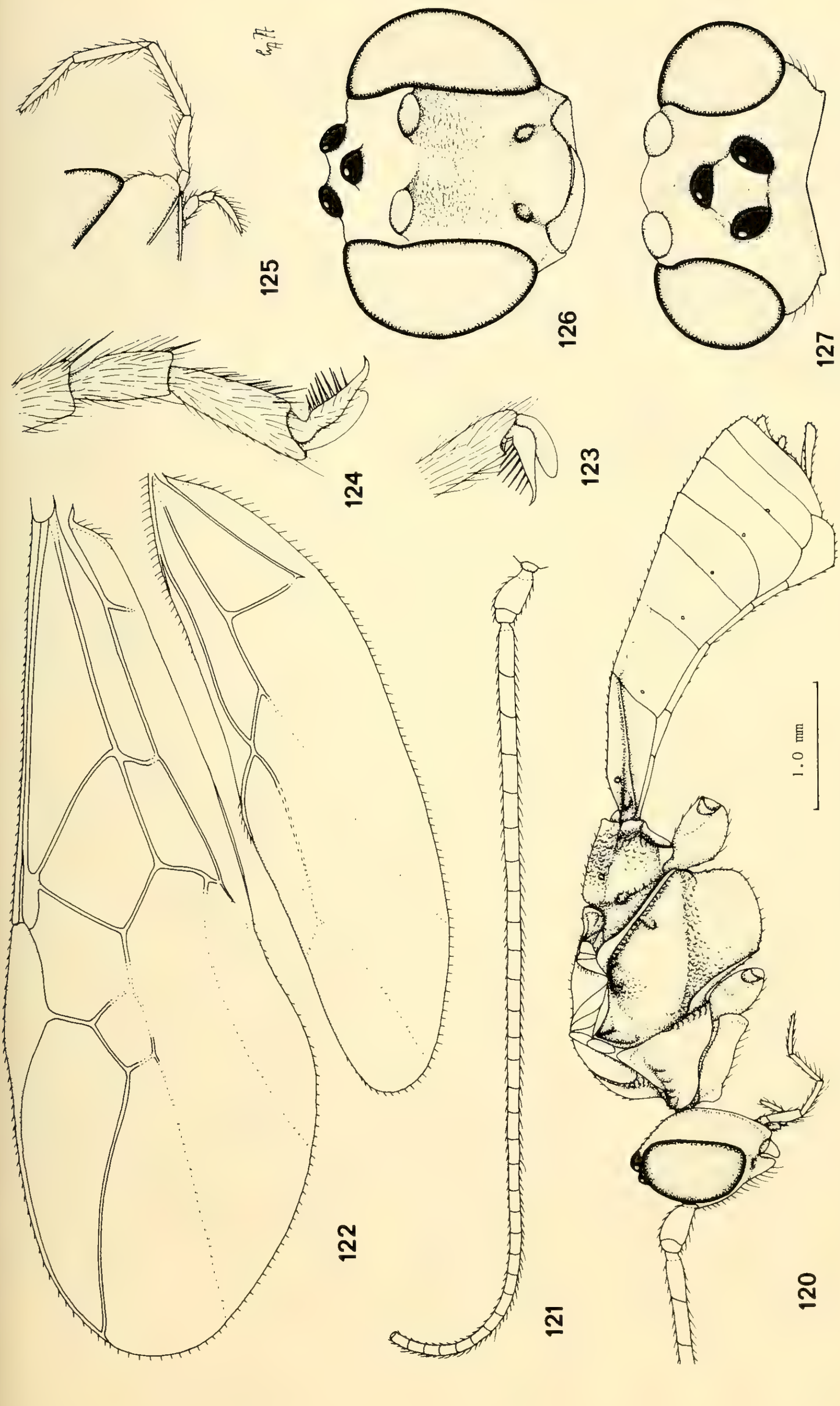
Figs. 98—104, *Exasticolus fuscicornis* (Cameron), holotype, but 98, 100 and 103 after ♀ from Peru, Pucallpa. 98, apex of inner side of hind tibia, dorso-lateral aspect; 99, hind leg; 100, antenna; 101, mesonotum, dorsal aspect; 102, outer hind claw; 103, apex of antenna; 104, 1st—3rd tergites, dorsal aspect. 98, 102, 103: 5.0 ×; 99, 100: scale-line, 1 ×; 101, 104: 2.0 ×



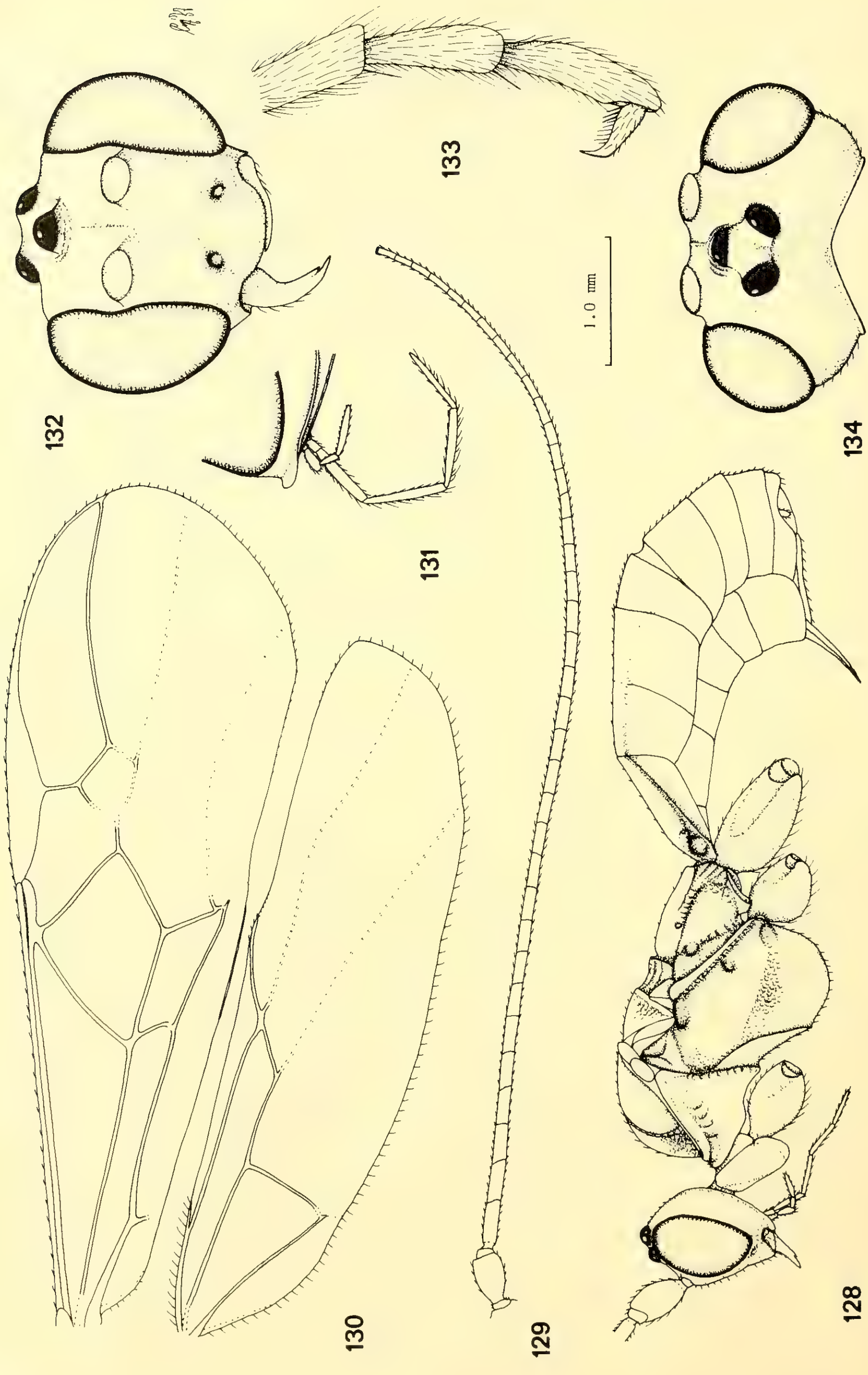
Figs. 105—111, *Exasticolus nigriceps* (Enderlein), holotype. 105, habitus, lateral aspect; 106, outer middle claw; 107, wings; 108, antenna; 109, apex of antenna; 110, head, frontal aspect; 111, 1st tergite, dorsal aspect. 105, 107, 108: scale-line, 1 ×; 106, 109: 4.2 ×; 110, 111: 1.8 ×



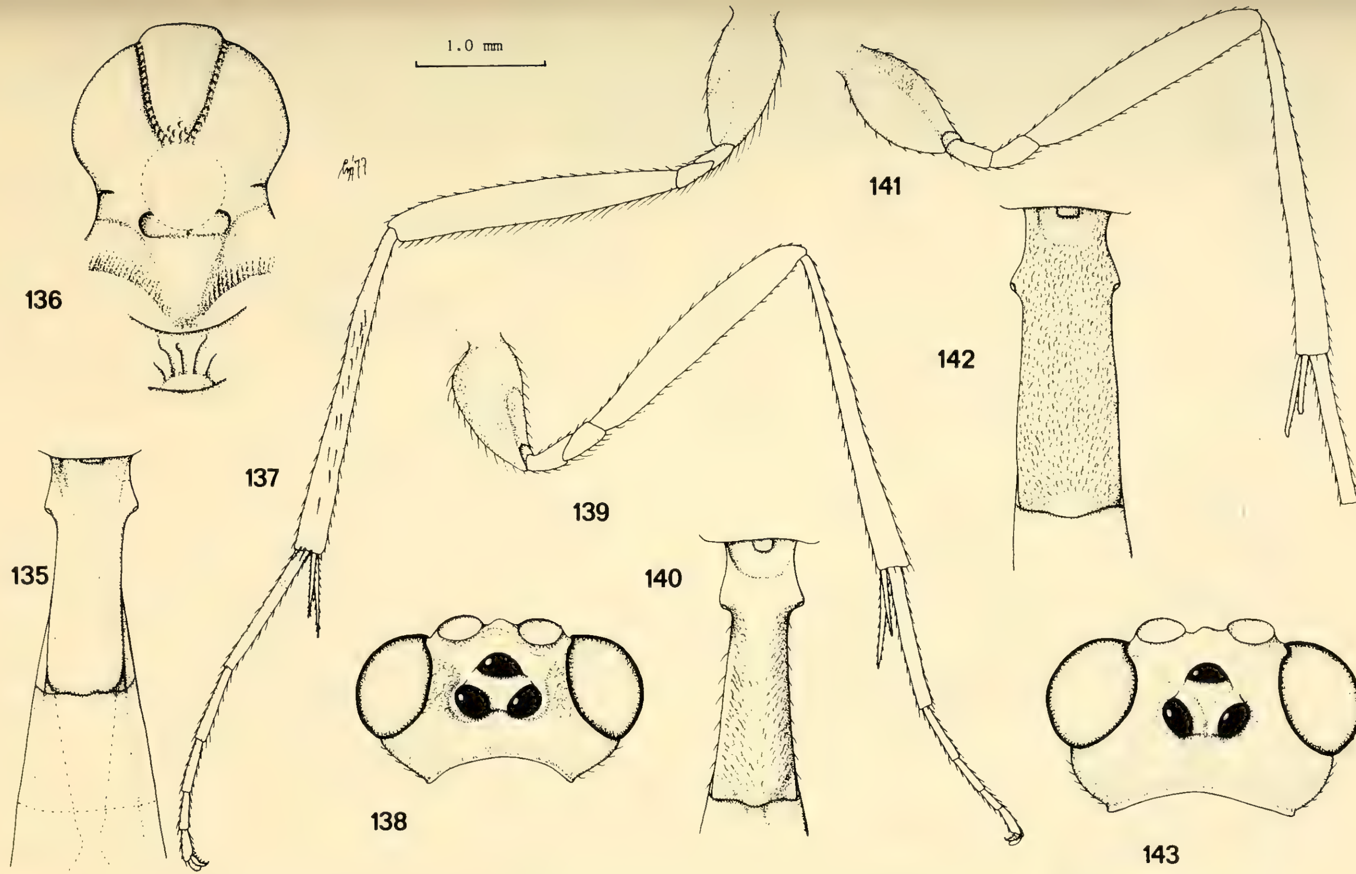
Figs. 112—115, *Homolobus (Apatia) unicolor* (Enderlein), paralectotype, ♂ (but 113 of lectotype). 112, detail of hind tibial spurs, lateral aspect; 113, hind leg; 114, 1st tergite, dorsal aspect; 115, outer hind claw. Figs. 116—119, *Exasticolus nigriceps* (Enderlein), holotype. 116, head, dorsal aspect; 117, palpi; 118, hind leg; 119, mesonotum, dorsal aspect. 112, 115: 4.2 ×; 113, 118: scale-line, 1 ×; 114, 116, 117, 119: 1.8 ×



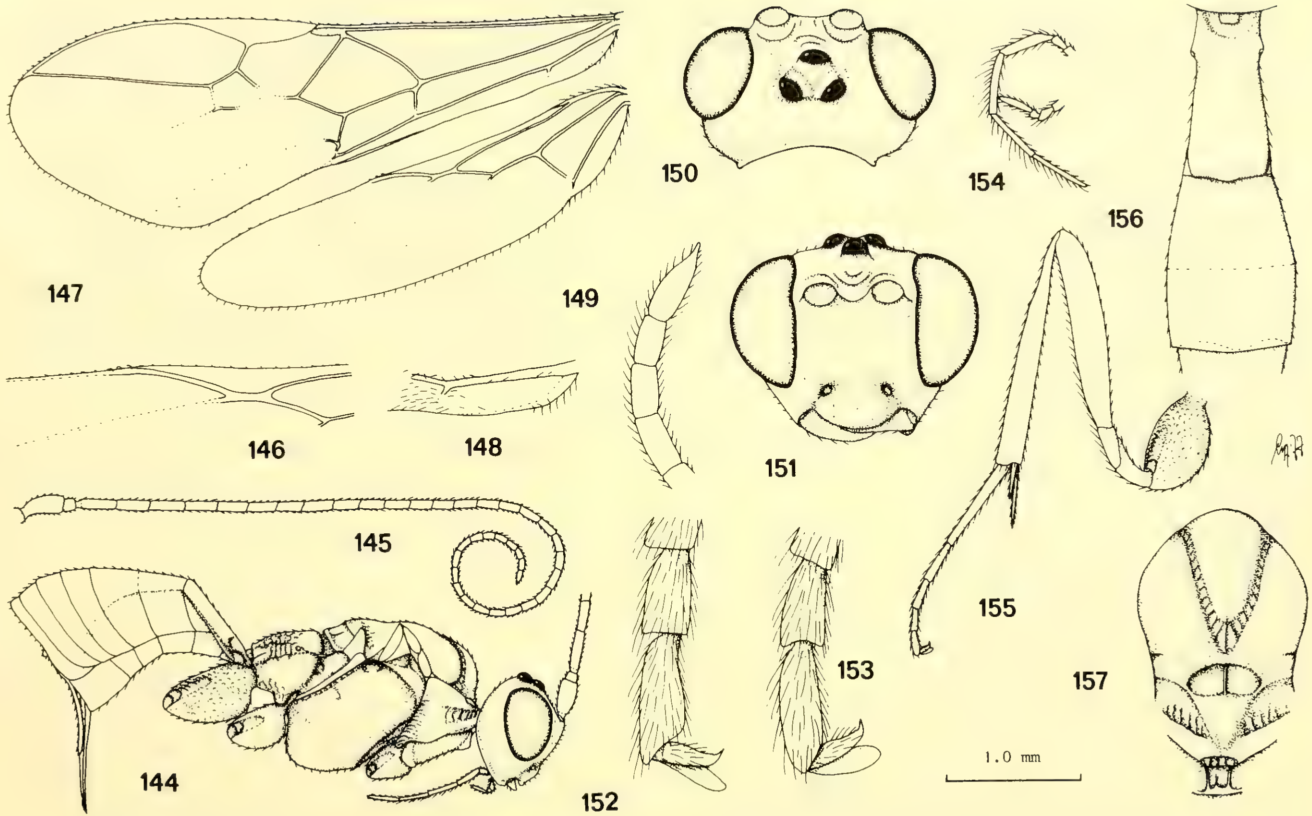
Figs. 120—127, *Homolobus (Apatia) elagabalus* (Nixon), holotype. 120, habitus, lateral aspect; 121, antenna; 122, wings; 123, outer fore claw; 124, inner middle claw; 125, palpi; 126, head, frontal aspect; 127, head, dorsal aspect. 120—122: scale-line, 1 ×; 123, 124: 5.0 ×; 125—127: 2.0 ×



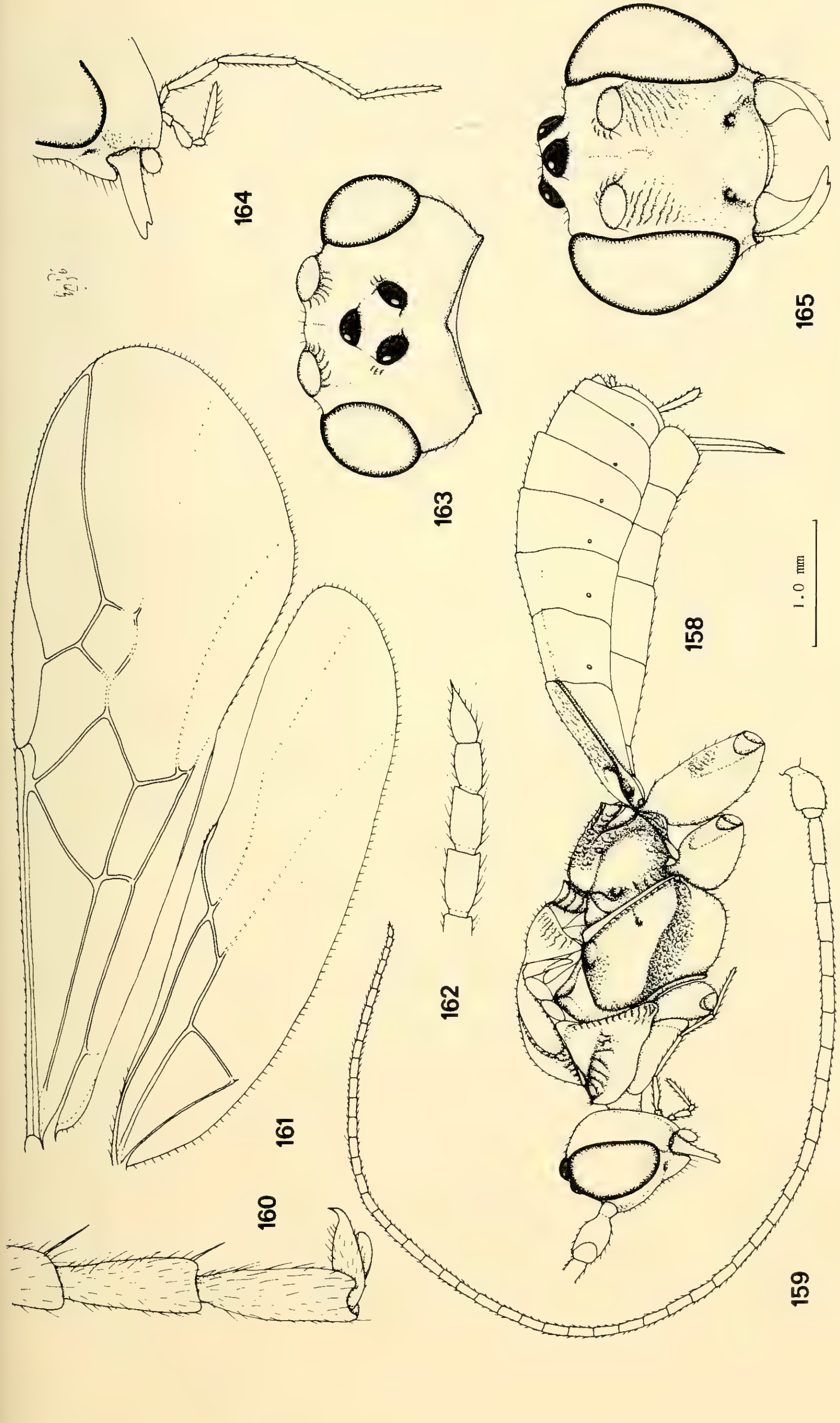
Figs. 128—134, *Homolobus (Apatia) australiensis* (Nixon), holotype. 128, habitus, lateral aspect; 129, antenna; 130, wings; 131, palpi; 132, head, frontal aspect; 133, inner hind claw; 134, head, dorsal aspect. 128—130: scale-line, 1 ×; 131, 132, 134: 2.0 ×; 133: 5.0 ×



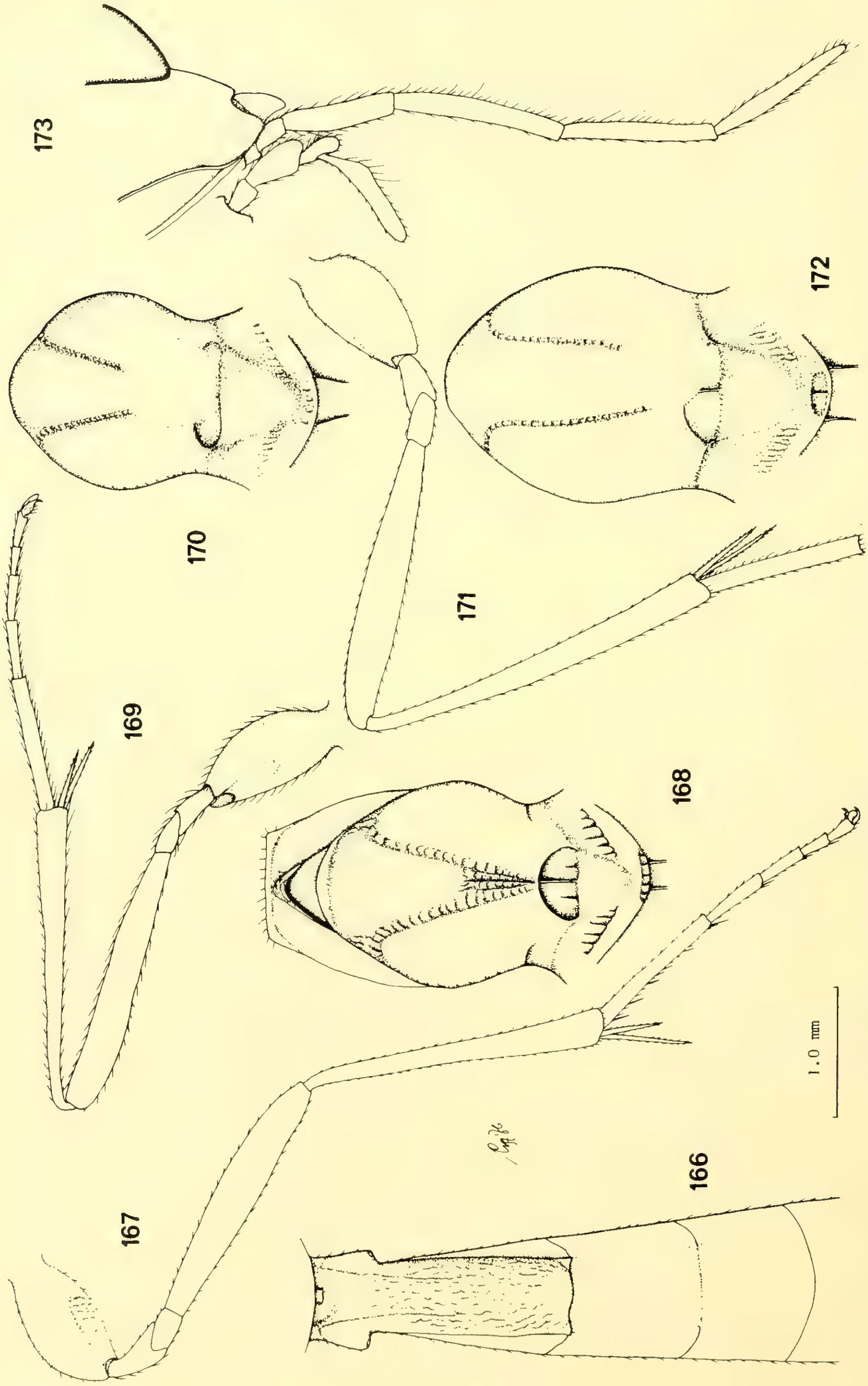
Figs. 135—137, *Homolobus (Apatia) australiensis* (Nixon), holotype. 135, 1st—3rd tergits, dorsal aspect; 136, mesonotum, dorsal aspect; 137, hind leg. Figs. 138—140, *Homolobus (Apatia) priapus* (Nixon), holotype. 138, head, dorsal aspect; 139, hind leg; 140, 1st tergite, dorsal aspect. Figs. 141—143, *Homolobus (Apatia) pulchricornis* (Nixon), holotype. 141, hind leg; 142, 1st tergite, dorsal aspect; 143, head, dorsal aspect. 135, 136: 2.0 ×; 137: scale-line, 1 ×; 138, 140, 142, 143: 1.8 ×; 139, 141: 0.9 ×



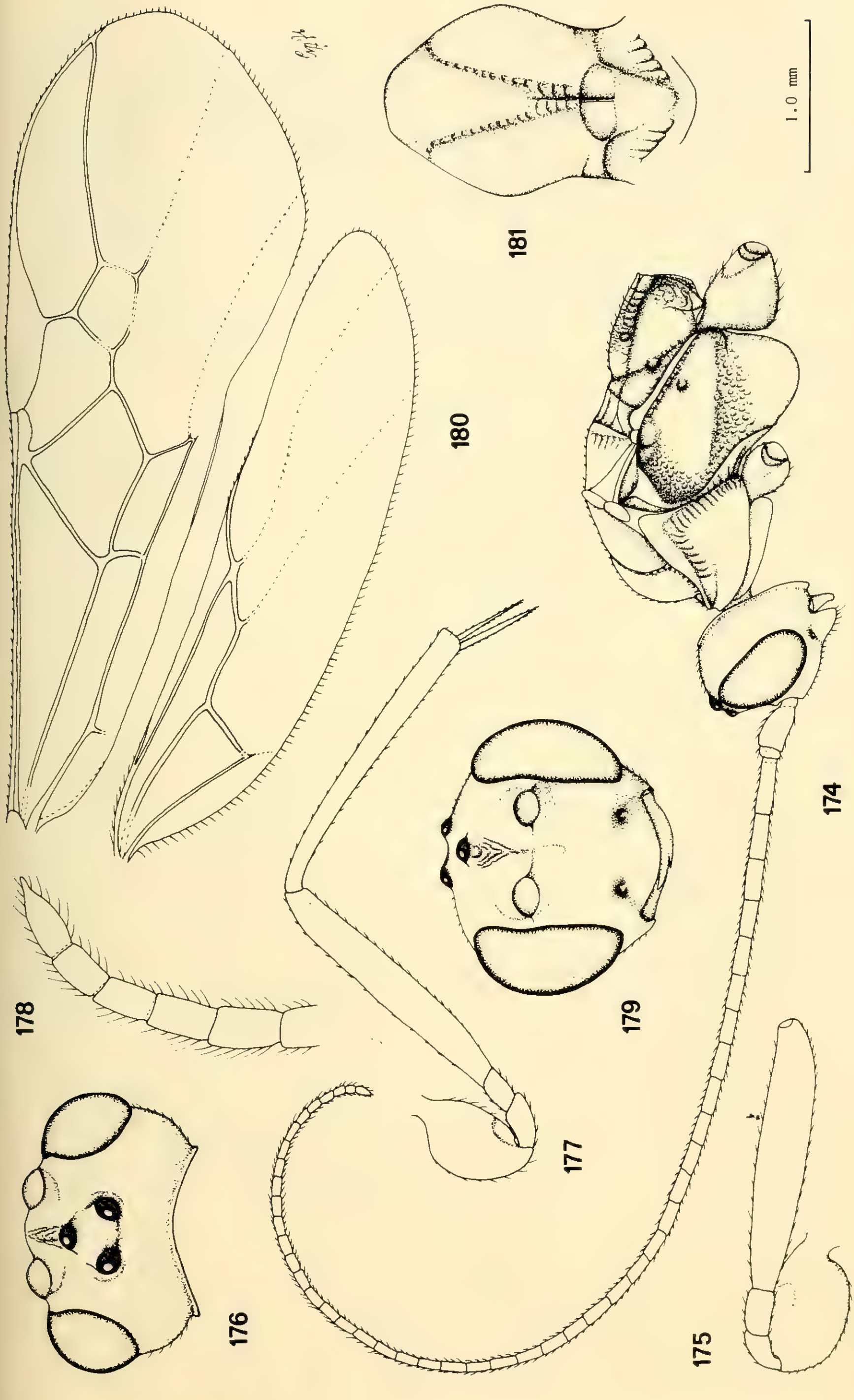
Figs. 144-157, *Homolobus (Apatia) albipalpis* (Granger), ♀, Malagasy, Ranomafana. 144, habitus, lateral aspect; 145, antenna; 146, detail of vein SC + R1 of hind wing; 147, wings; 148, detail of veins 1A + 2A and 2A of fore wing; 149, apex of antenna; 150, head, dorsal aspect; 151, head, frontal aspect; 152, inner hind claw; 153, outer hind claw; 154, palpi; 155, hind leg; 156, 1st—3rd tergites, dorsal aspect; 157, mesonotum, dorsal aspect. 144, 145, 147, 155: scale-line, 1 ×; 146, 148, 150, 151, 154, 156, 157: 2.0 ×; 149, 152, 153: 5.0 ×



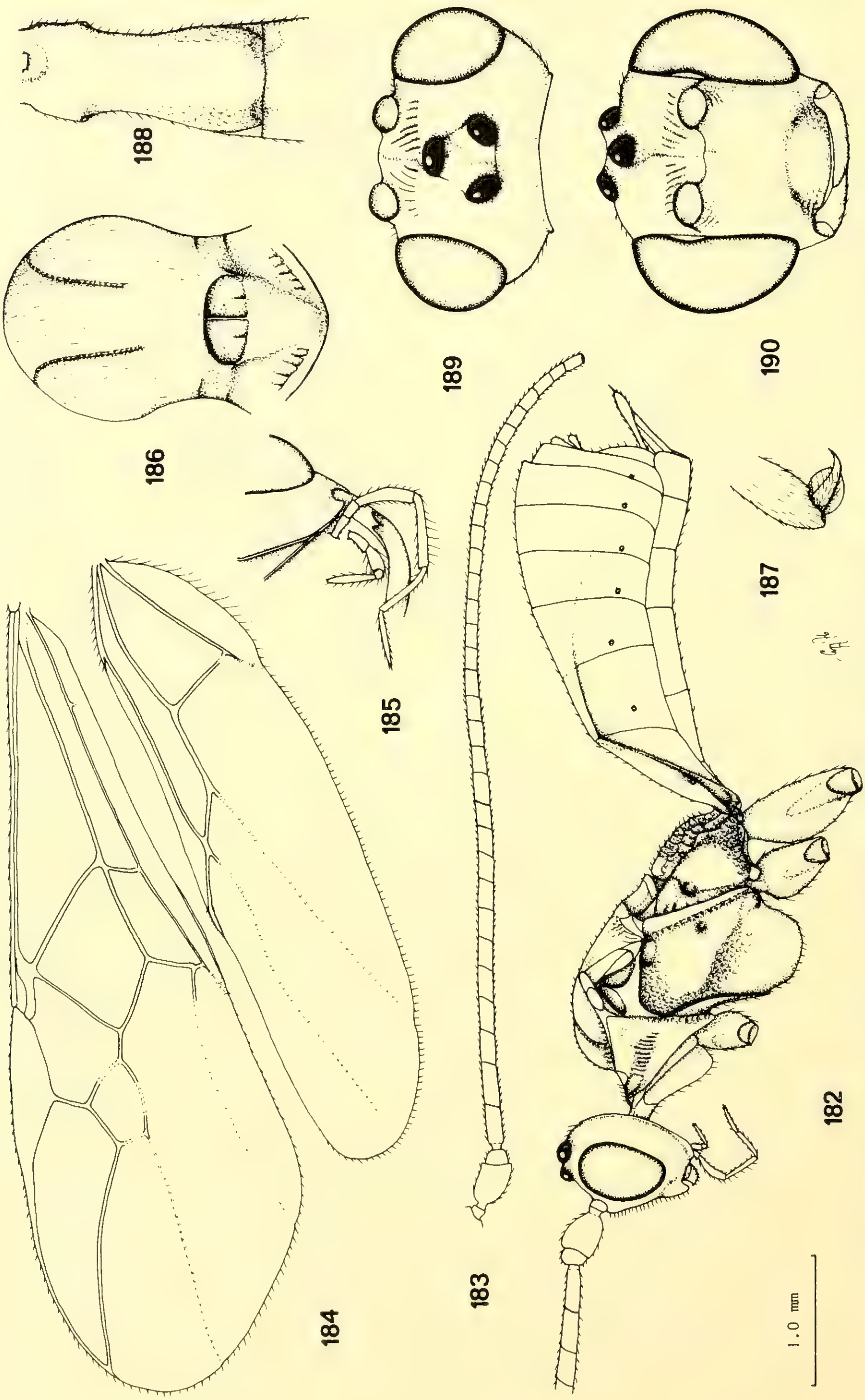
Figs. 158—165, *Homolobus (Apatia) truncator* (Say), neotype. 158, habitus, lateral aspect; 159, antenna; 160, outer hind claw; 161, wings; 162, apex of antenna; 163, head, dorsal aspect; 164, palpi; 165, head, frontal aspect. 158, 159, 161: scale-line, 1 ×; 160, 162: 5.0 ×; 163—165: 2.0 ×



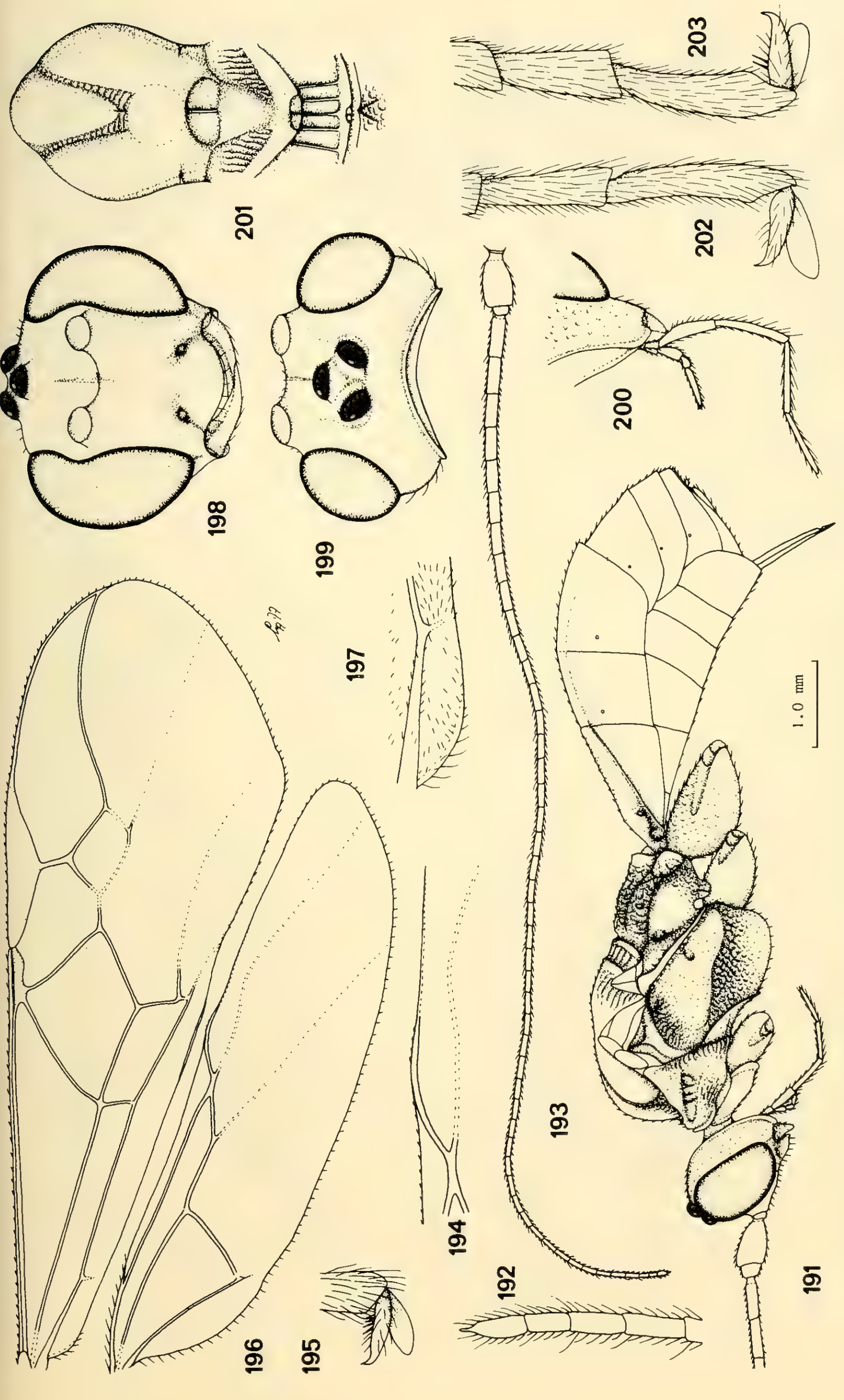
Figs. 166—168, *Homolobus (Apatia) truncator* (Say), neotype. 166, 1st-3rd tergites, dorsal aspect; 167, hind leg; 168, mesonotum, dorsal aspect. Figs. 169, 170, *Homolobus (Homolobus) discolor* (Wesmael), lectotype. 169, hind leg; 170, mesonotum, dorsal aspect. Figs. 171—173, *Homolobus (Chartolobus) wesmaeli* (Bengtsson), lectotype. 171, hind leg; 172, mesonotum, dorsal aspect; 173, palpi. 166, 168, 170, 172: 2.0 ×; 167, 169, 171: scale-line, 1 ×; 173: 3.0 ×



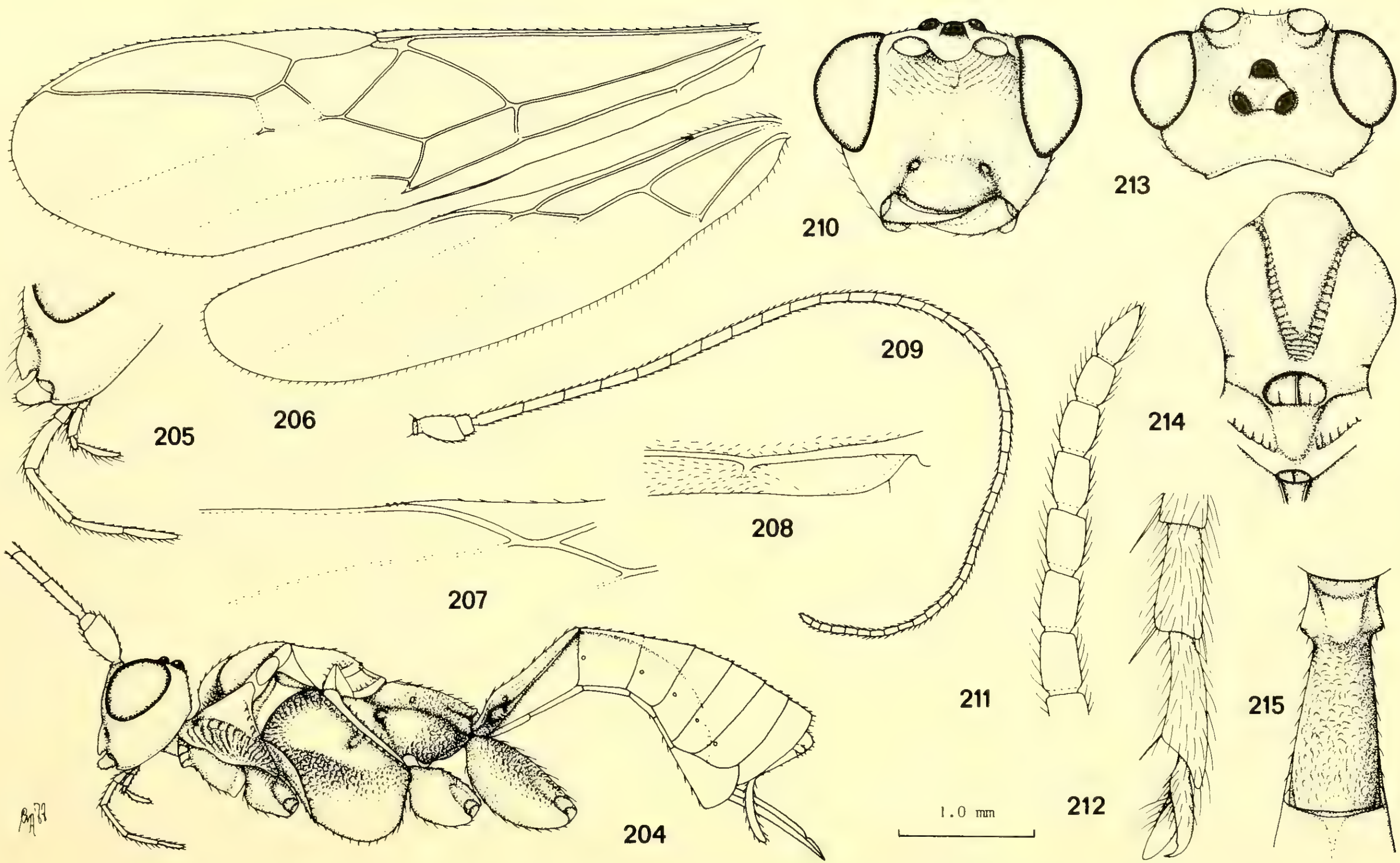
Figs. 174—176, 178—181, *Homolobus (Apatia) crassicalcaratus* (Viereck), holotype. 174, habitus, lateral aspect; 175, hind leg (remnant); 176, head, dorsal aspect; 178, apex of antenna; 179, head, frontal aspect; 180 wings; 181, mesonotum, dorsal aspect. Fig. 177, *Homolobus (Apatia) pallidistigmus* (Cameron), holotype, middle leg. 174, 175, 180: scale-line, 1 ×; 176, 179, 181: 1.5 ×; 177: 0.8 ×; 178: 5.0 ×



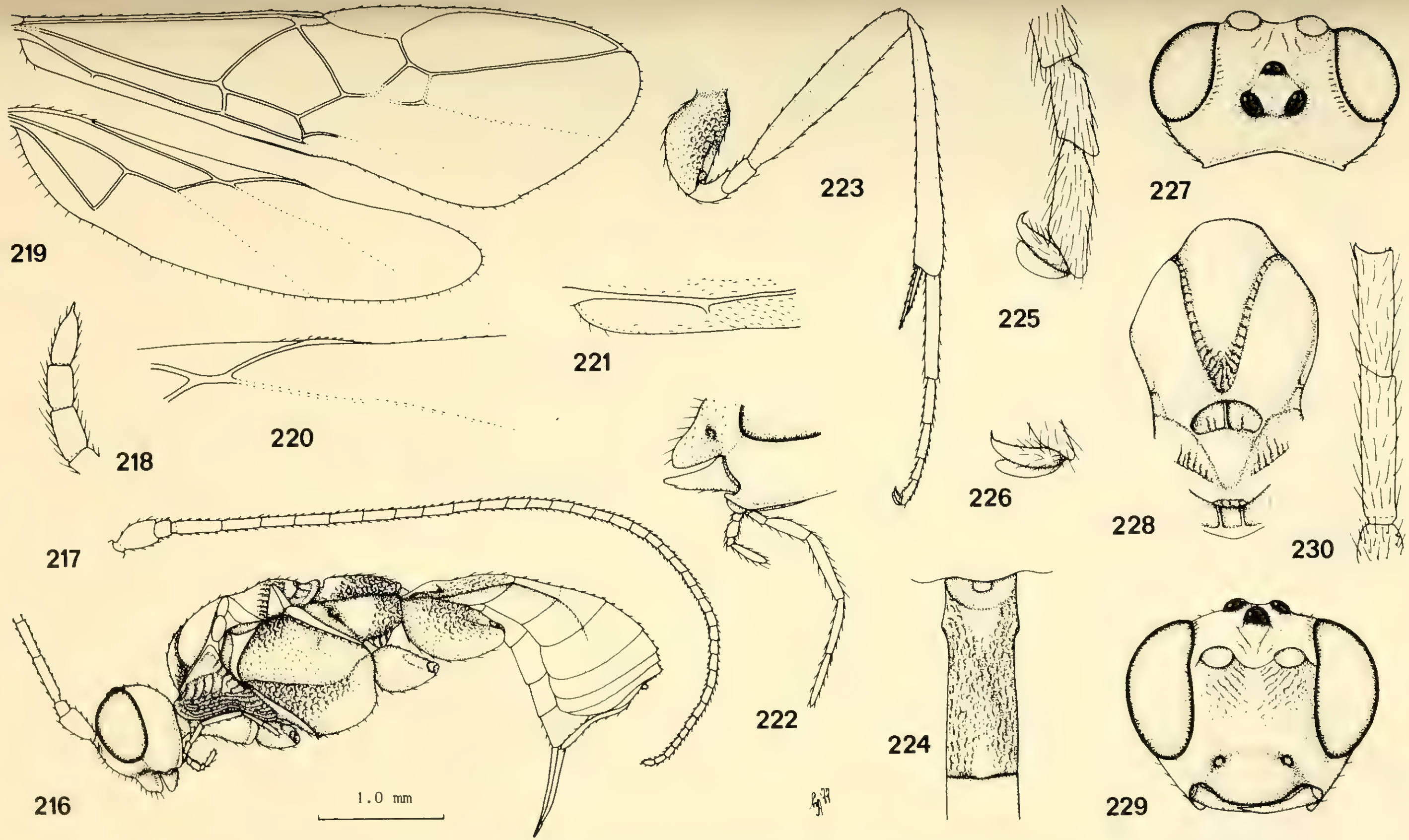
Figs. 182—190, *Homolobus* (*Apatia*) *unicolor* (Enderlein), lectotype. 182, habitus, lateral aspect; 183, antenna; 184, wings; 185, palpi; 186, mesonotum, dorsal aspect; 187, fore claw; 188, 1st tergite, dorsal aspect; 189, head, dorsal aspect; 190, head, frontal aspect. 182—184: scale-line, 1 ×; 185, 186, 188—190: 2.0 ×; 187: 5.0 ×



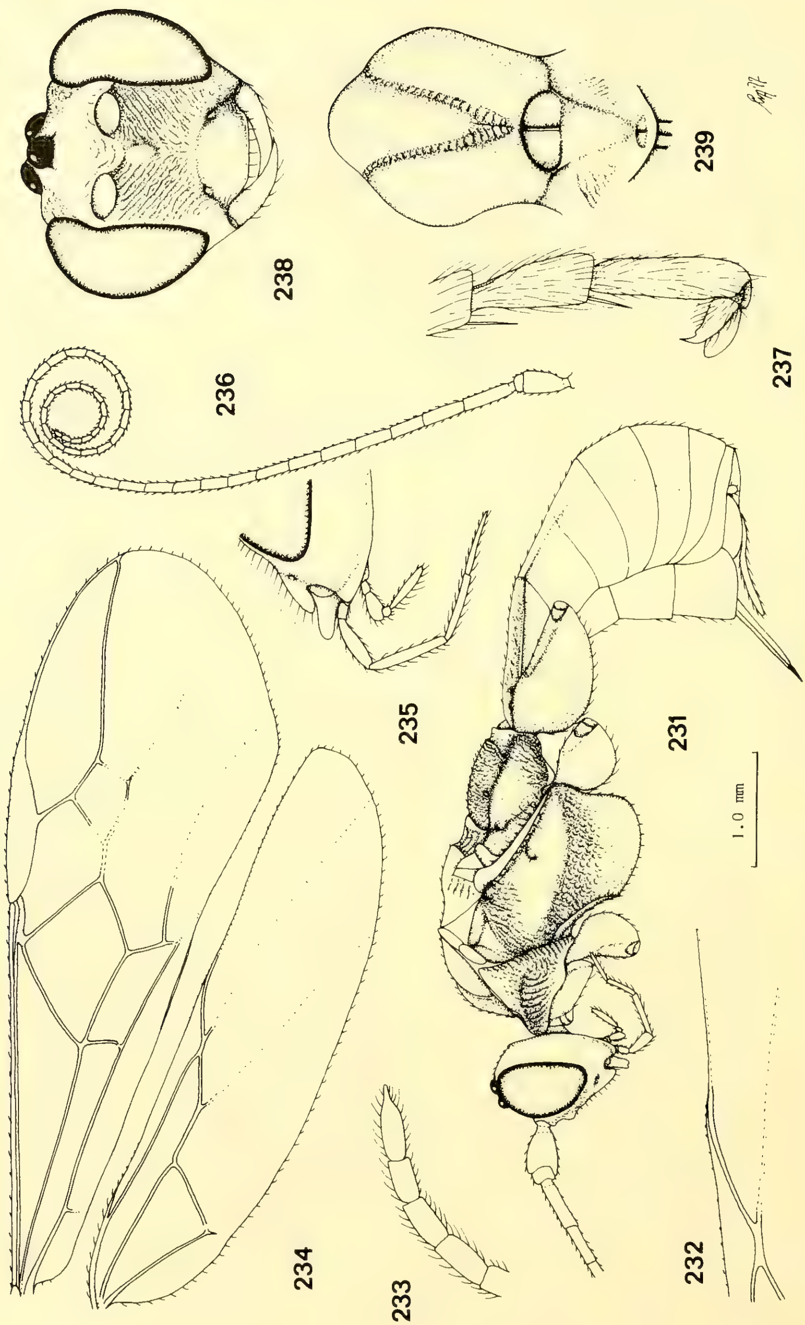
Figs. 191—203, *Homolobus (Apatia) rufithorax* (Granger), lectotype. 191, habitus, lateral aspect; 192, apex of antenna; 193, antenna; 194, detail of veins SC + R1 and SR of hind wing; 195, inner fore claw; 196, wings; 197, detail of vein 1A + 2A of fore wing; 198, head, frontal aspect; 199, head, dorsal aspect; 200, palpi; 201, mesonotum, dorsal aspect; 202, inner hind claw; 203, outer hind claw. 191, 193, 196: scale-line, 1 ×; 192, 195, 202, 203: 5.0 ×; 194, 197—201: 2.0 ×



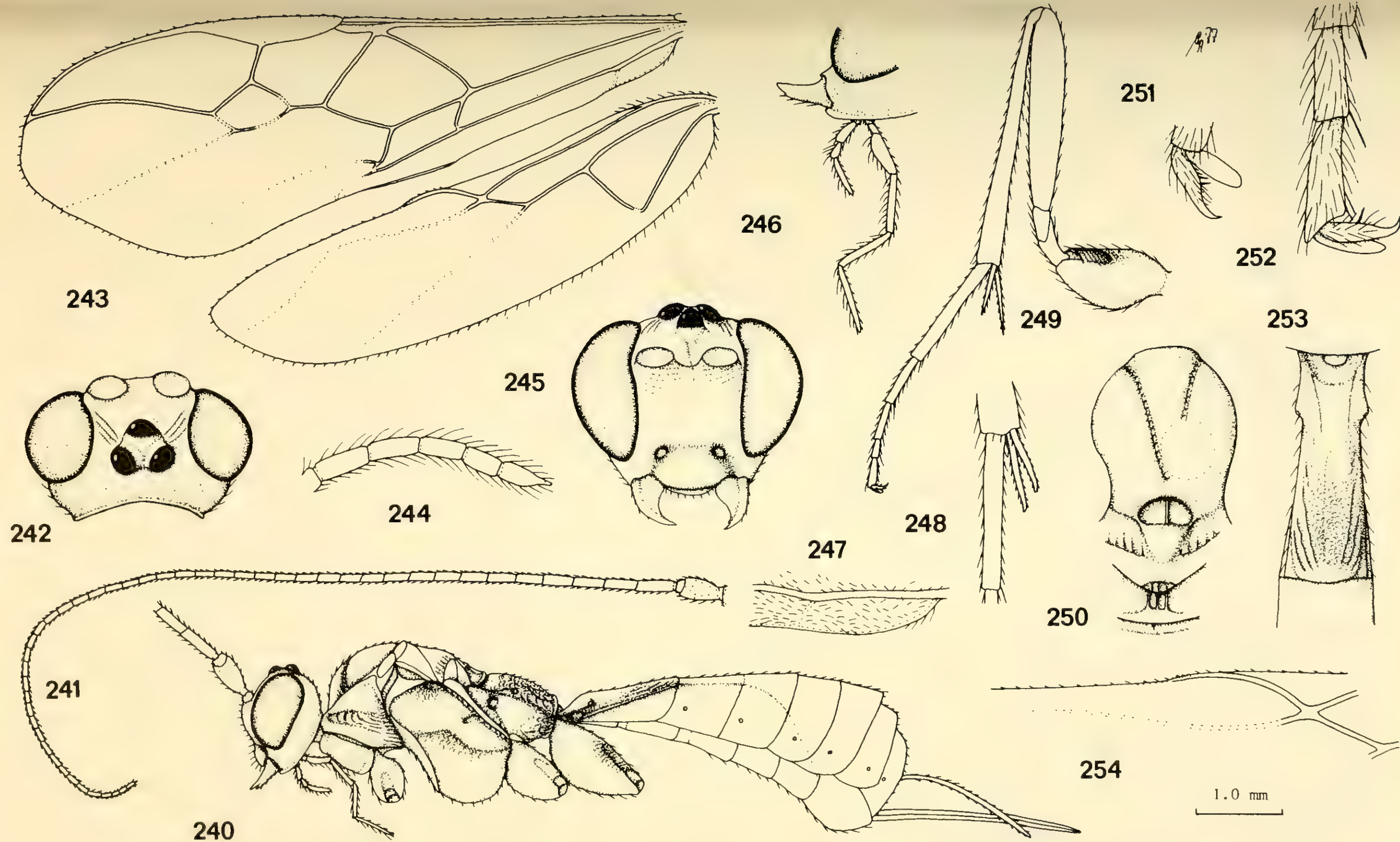
Figs. 204—215, *Homolobus (Apatia) maculatus* spec. nov., holotype. 204, habitus, lateral aspect; 205, palpi; 206, wings; 207, detail of veins SC + R1 and SR of hind wing; 208, detail of vein 1A + 2A of fore wing; 209, antenna; 210, head, frontal aspect; 211, apex of antenna; 212, inner hind claw; 213, head, dorsal aspect; 214, mesonotum, dorsal aspect; 215, 1st tergite, dorsal aspect. 204, 206, 209: scale-line, 1 ×; 205, 207, 208, 210, 213—215: 2.0 ×; 211. 212: 5.0 ×



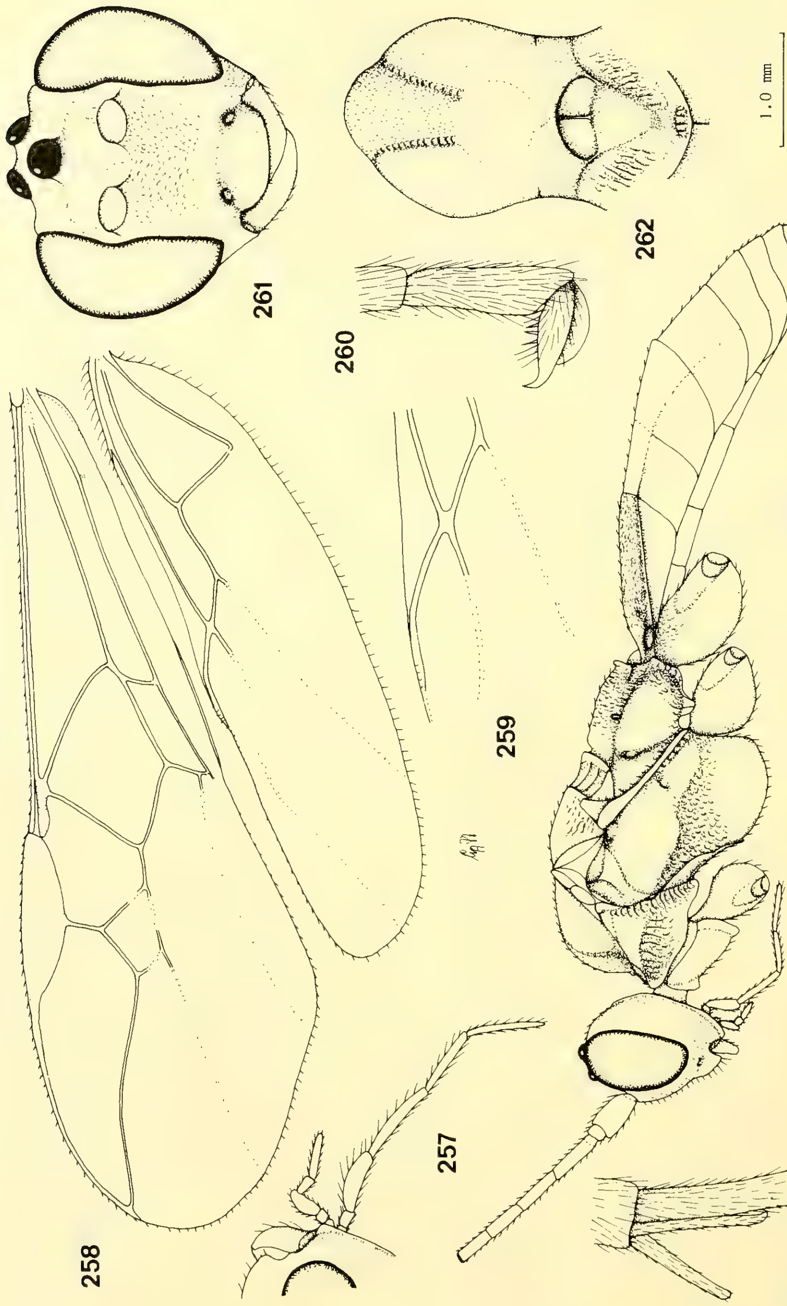
Figs. 216—230, *Homolobus (Apatia) alternipes* spec. nov., holotype. 216, habitus, lateral aspect; 217, antenna; 218, apex of antenna; 219, wings; 220, detail of veins SC + R1 and SR of hind wing; 221, detail of vein 1A + 2A of fore wing; 222, palpi; 223, hind leg; 224, 1st tergite, dorsal aspect; 225, inner hind claw; 226, outer hind claw; 227, head, dorsal aspect; 228, mesonotum, dorsal aspect; 229, head, frontal aspect; 230, 3rd and 4th antennal segments, inner aspect. 216, 217, 219, 223: scale-line, 1 ×; 218, 225, 226: 5.0 ×; 220—222, 224, 227—229: 2.0 ×; 230: 3.0 ×



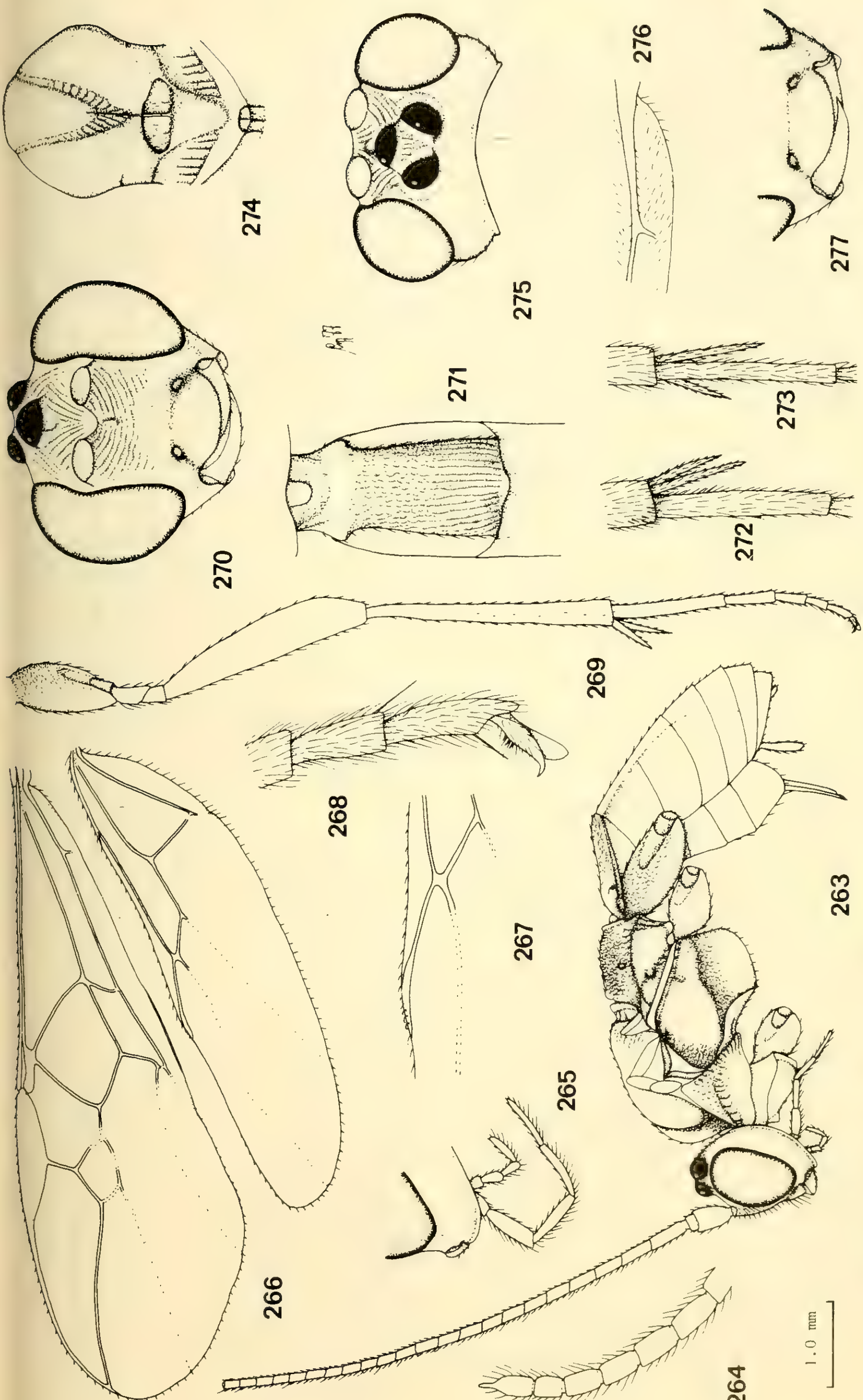
Figs. 231—239, *Homolobus (Apatia) priapus* (Nixon), holotype. 231, habitus, lateral aspect; 232, detail of veins SC + R1 and SR of hind wing; 233, apex of antenna; 234, wings; 235, palpi; 236, antenna; 237, inner hind claw; 238, head, frontal aspect; 239, mesonotum, dorsal aspect. 231, 234, 236: scale-line, 1 ×; 232, 235, 238, 239: 2.0 ×; 233, 237: 5.0 ×



Figs. 240—254, *Homolobus (Apatia) lacteiceps* spec. nov., holotype, but 249 of allotype. 240, habitus, lateral aspect; 241, antenna; 242, head, dorsal aspect; 243, wings; 244, apex of antenna; 245, head, frontal aspect; 246, palpi; 247, detail of vein 1A + 2A of fore wing; 248; hind leg; 249, hind tibial spurs of ♂, lateral aspect; 250, mesonotum, dorsal aspect; 251, outer hind claw; 252, inner hind claw; 253, 1st tergite, dorsal aspect; 254, detail of veins SC + R1 and SR of hind wing. 240, 241, 243, 248: scale-line, 1 ×; 242, 245—247, 249, 250, 253, 254: 2.0 ×; 244, 251, 252: 5.0 ×



Figs. 255—262, *Homolobus (Apatia) pulchricornis* (Nixon), holotype. 255, habitus, lateral aspect; 256, hind tibial spurs, lateral aspect; 257, palpi; 258, wings; 259, detail of vein SC + R1 of hind wing; 260, inner middle claw; 261, head, frontal aspect; 262, mesonotum, dorsal aspect. 255, 258: scale-line, 1 ×; 256, 257, 259, 261, 262: 2.0 ×



Figs. 263—277, *Homolobus (Apatia) huddlestoni* spec. nov., holotype, but 264, 272, 273 and 277 of allotype. 263, habitus, lateral aspect; 264, apex of antenna; 265, palpi; 266, wings; 267, detail of veins SC + R1 and SR of hind wing; 268, outer hind claw; 269, hind leg; 270, head, frontal aspect; 271, 1st tergite, dorsal aspect; 272, hind tibial spurs of ♂, lateral aspect; 273, hind tibial spurs of ♂, dorsal aspect; 274, mesonotum, dorsal aspect; 275, head, dorsal aspect; 276, detail of vein 1A + 2A of fore wing; 277, detail of clypeal region of ♂. 263, 266, 269: scale-line, 1 ×; 264, 268: 5.0 ×; 265, 267, 270—277: 2.0 ×

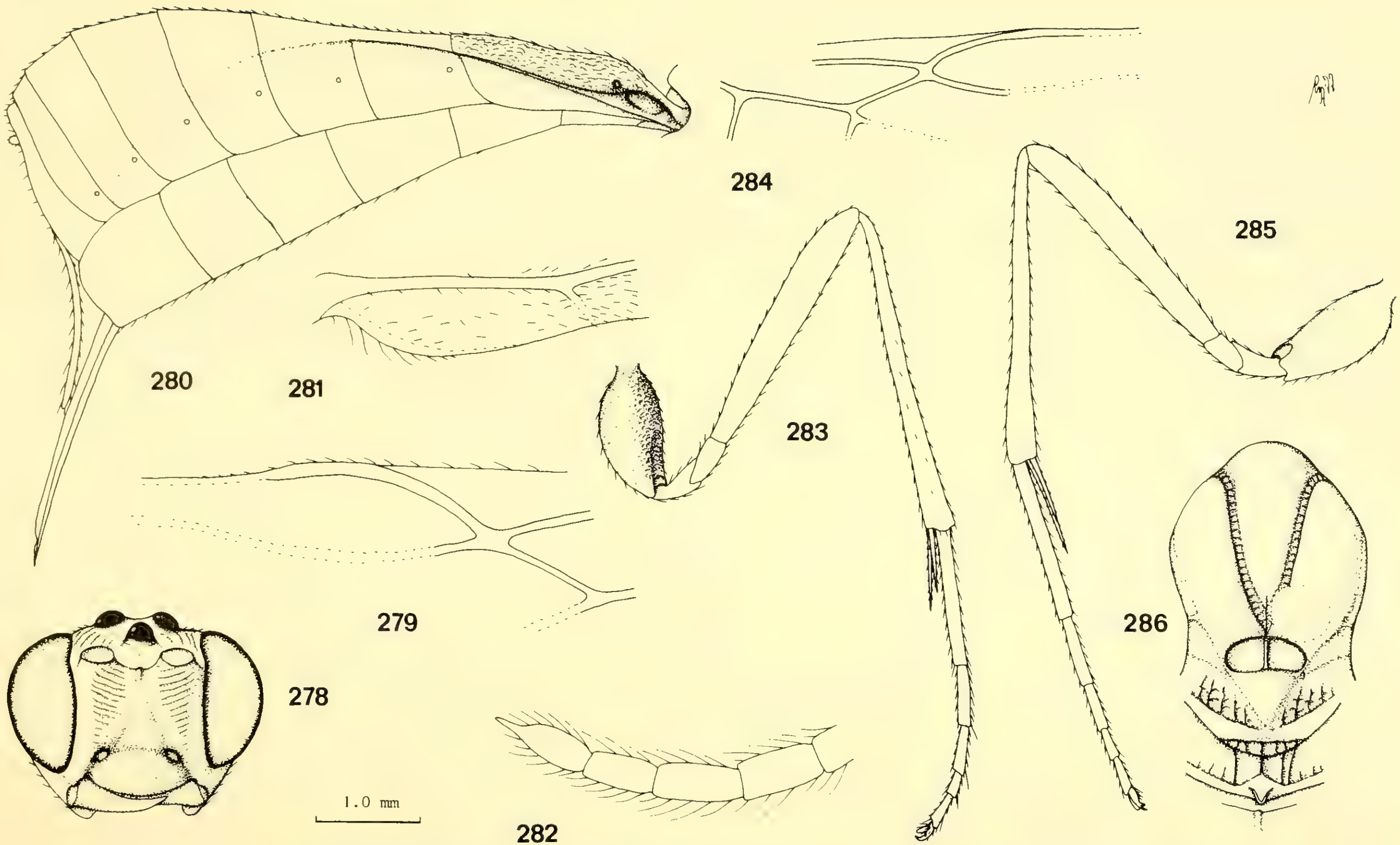
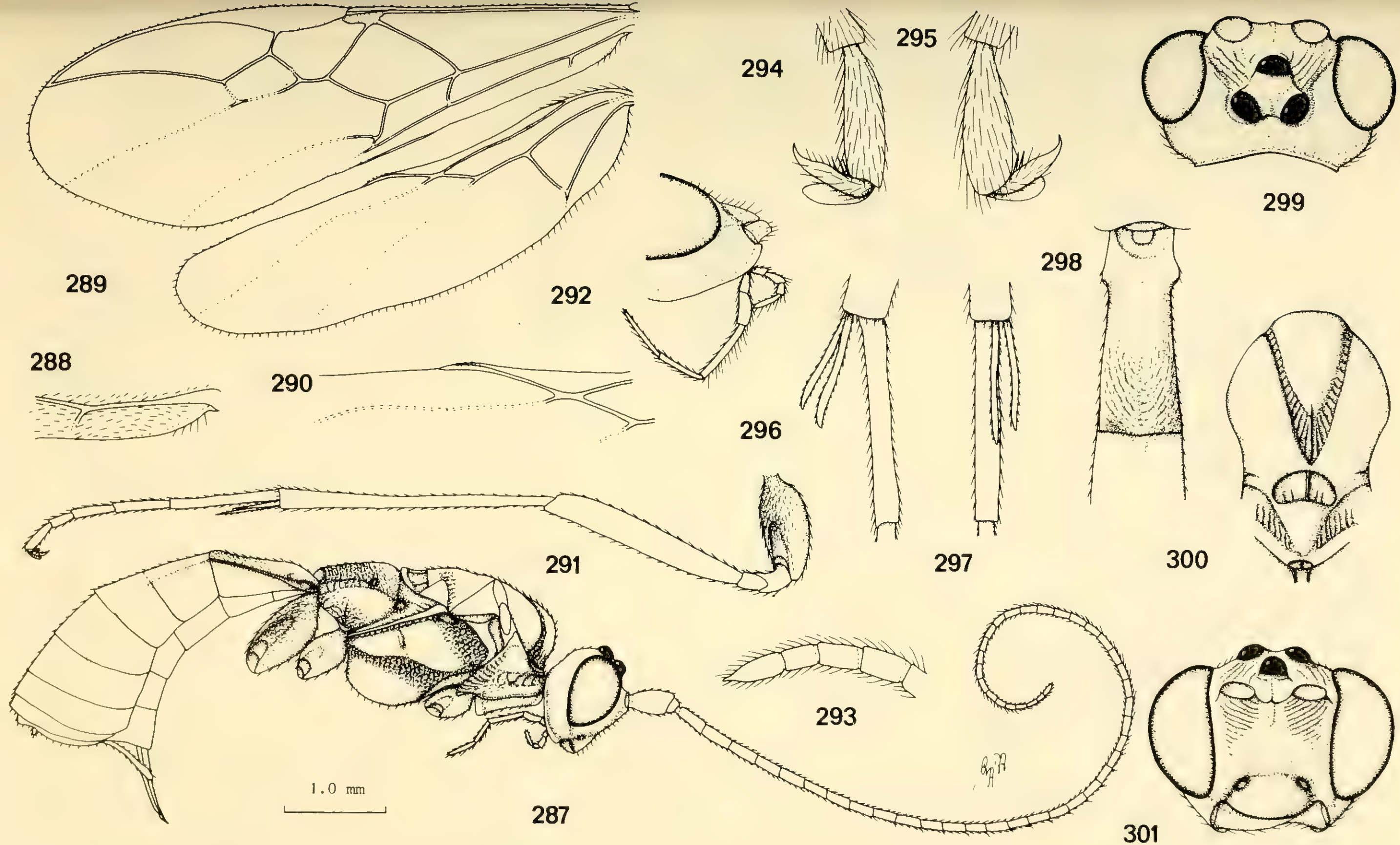
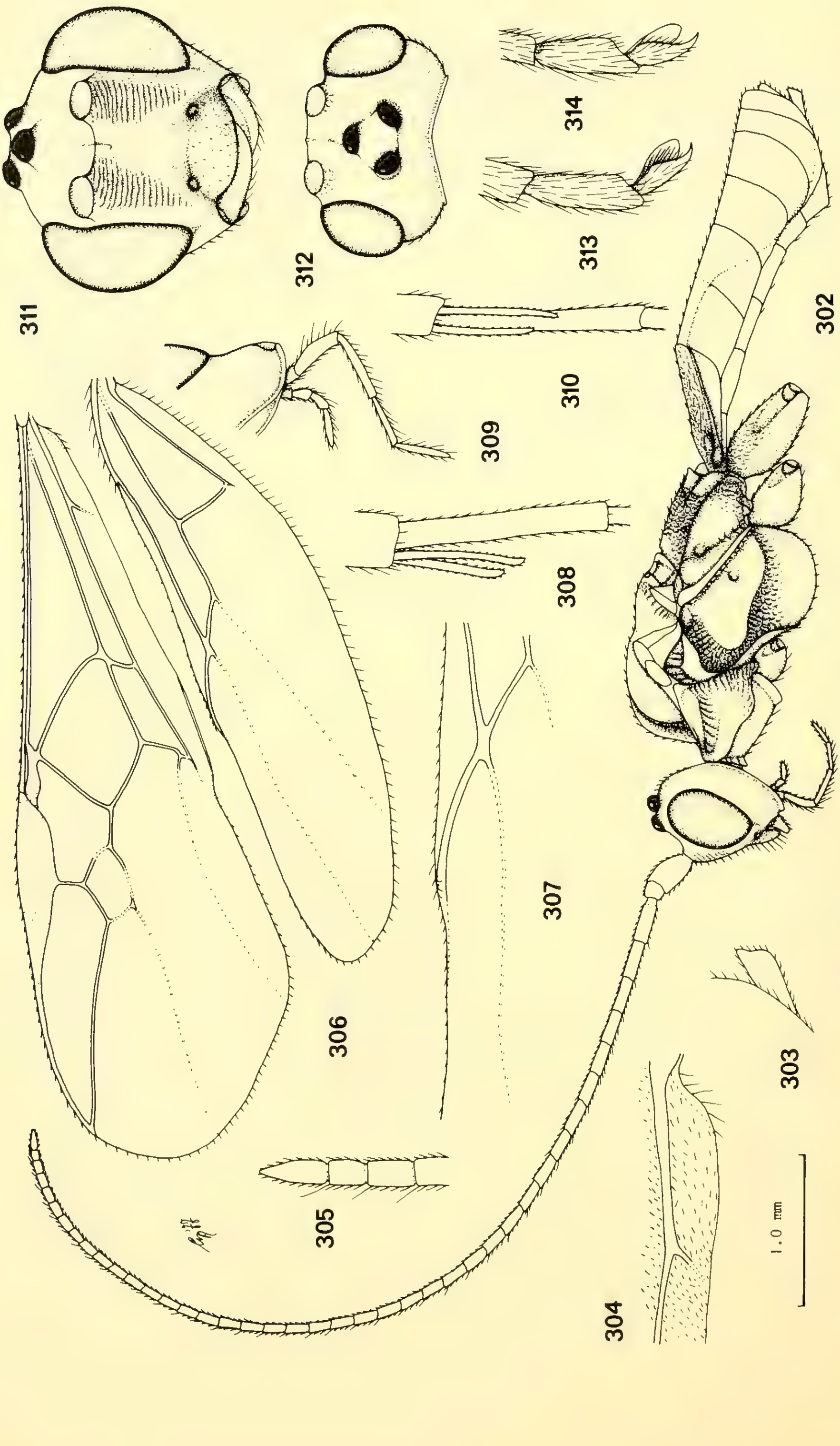


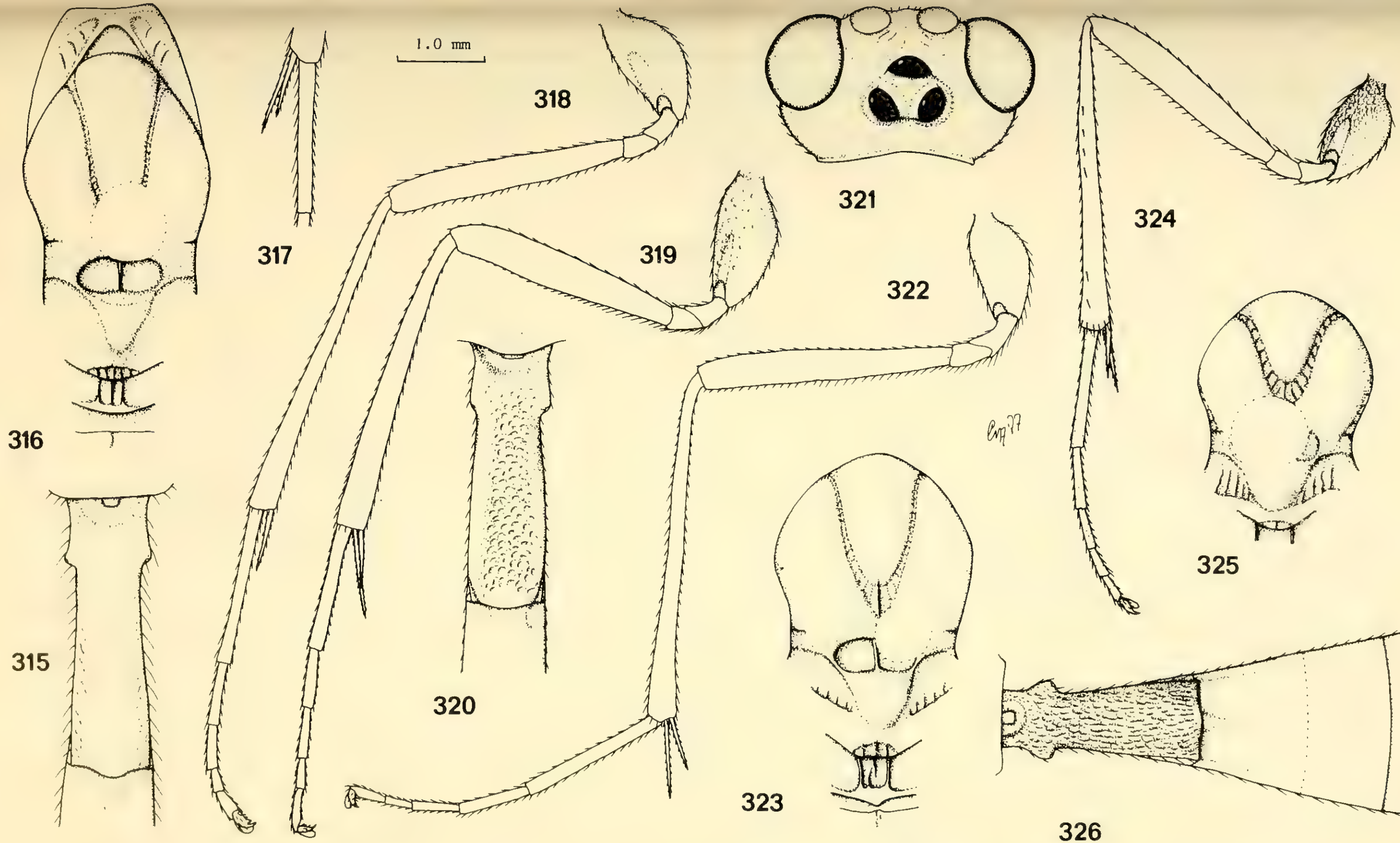
Fig. 278, *Homolobus (Apatia) ophioninus* (Vachal), ♂, Kenya, S. W. Elgon, head, frontal aspect. Figs. 279—282, *Homolobus (Apatia) pulchricornis* (Nixon), allotype. 279, detail of veins SC + R1 and SR of hind wing; 280, metasoma, lateral aspect; 281, detail of vein 1A + 2A of fore wing; 282, apex of antenna. Fig. 283, *Homolobus (Apatia) maculatus* spec. nov., holotype, hind leg. Fig. 284, *Homolobus (Apatia) elagabalus* (Nixon), Philippines, Manila, ♀, detail of veins lr-m and m-cu of hind wing. Figs. 285, 286, *Homolobus (Phylacter) bifurcatus* spec. nov., holotype, 285, hind leg; 286, mesonotum, dorsal aspect. 278, 284: 2.0 × scale-line; 279, 281: 2.6 × scale-line; 280, 283: 1.3 × scale-line; 282: 6.5 × scale-line; 285: 0.8 × scale-line; 286: 1.6 × scale-line



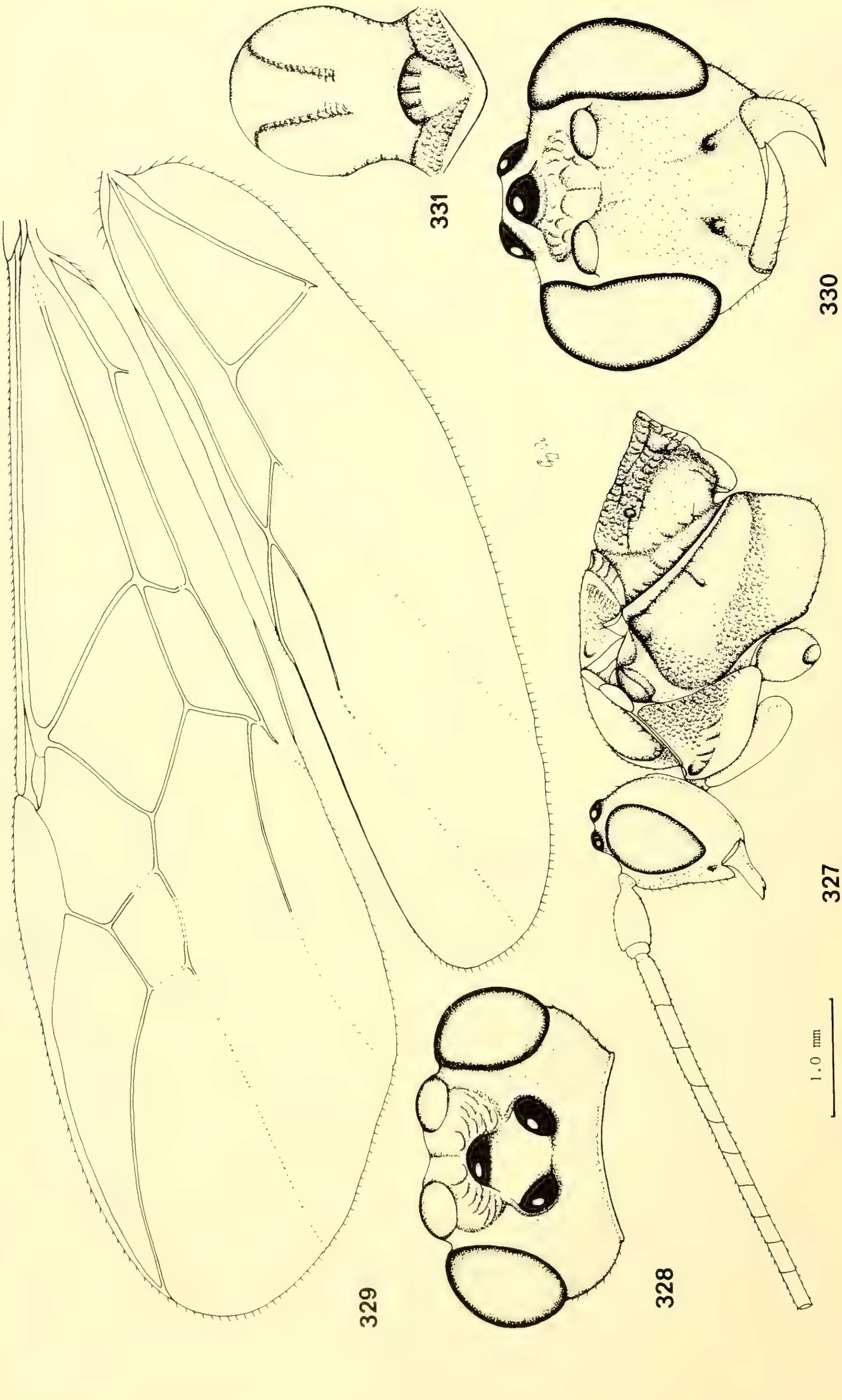
Figs. 287—301, *Homolobus (Apatia) ophioninus* (Vachal), ♀, Kenya, S. W. Elgon, but 296 and 297 of ♂. 287, habitus, lateral aspect; 288, detail of vein 1A + 2A of fore wing; 289, wings; 290, detail of veins SC + R1 and SR of hind wing; 291, hind leg; 292, palpi; 293, apex of antenna; 294, inner hind claw; 295, outer hind claw; 296, hind tibial spurs of ♂, lateral aspect; 297, hind tibial spurs of ♂, ventral aspect; 298, 1st tergite, dorsal aspect; 299, head, dorsal aspect; 300, mesonotum, dorsal aspect; 301, head, frontal aspect, 287, 289, 291: scale-line, 1 ×; 288, 290, 292, 296—301: 2.0 ×; 293—295: 5.0 ×



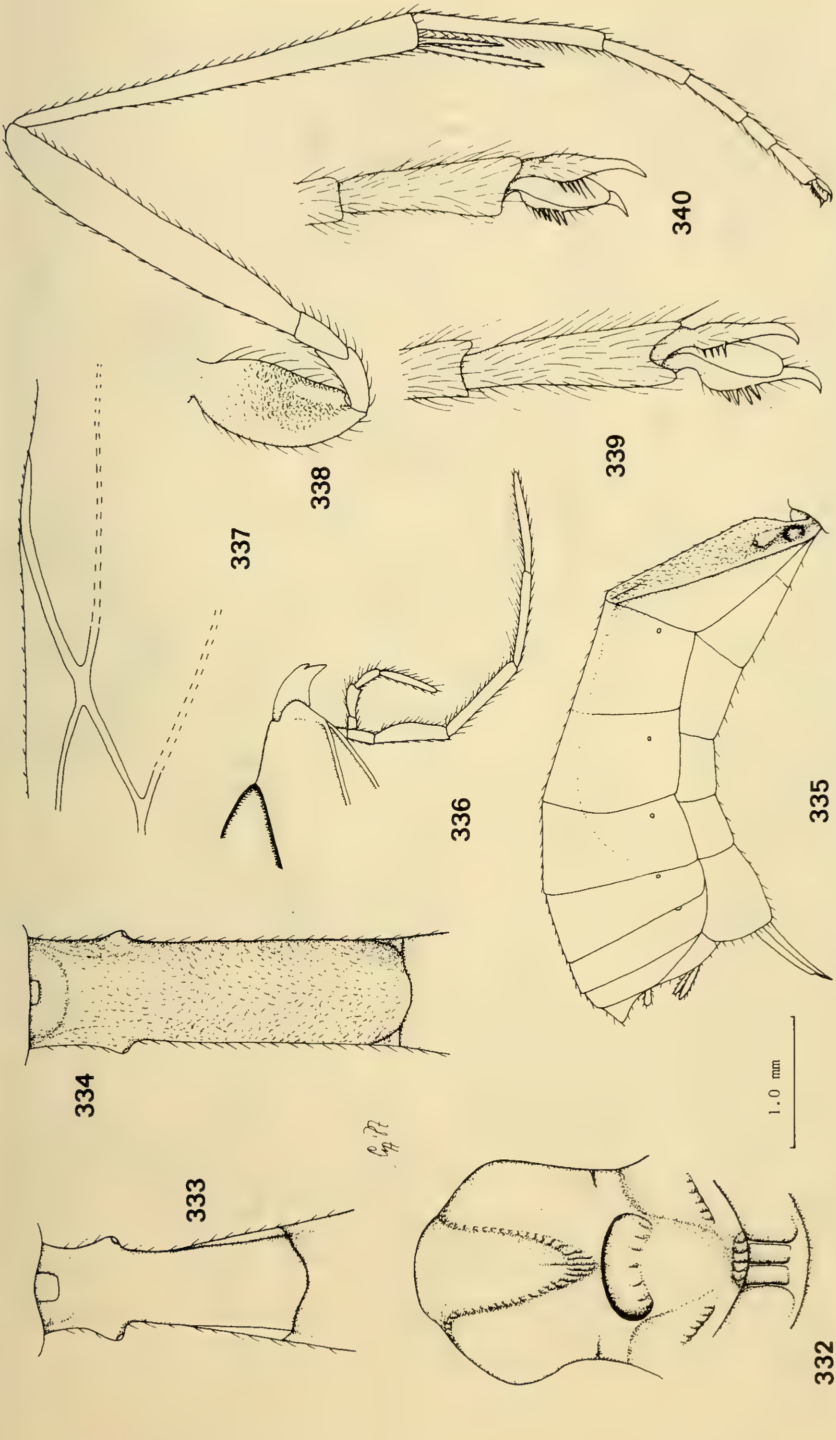
Figs. 302—314, *Homolobus (Apatia) truncatoides* spec. nov., holotype, but 308 and 310 of ♂ paratype from Spain, Almunecas. 302, habitus, lateral aspect; 303, detail of ovipositor sheath in undistorted position, lateral aspect; 304, detail of vein 1A + 2A of fore wing; 305, apex of antenna; 306, wings; 307, detail of veins SC + R1 and SR of hind wing; 308, hind tibial spurs of ♂, lateral aspect; 309, palpi; 310, hind tibial spurs of ♂, ventral aspect; 311, head, frontal aspect; 312, head, dorsal aspect; 313, inner hind claw; 314, outer hind claw. 302, 306: scale-line, 1 ×; 303: 2.5 ×; 304, 307—311: 1.8 ×); 305, 313, 314: 3.6 ×; 312: 1.5 ×



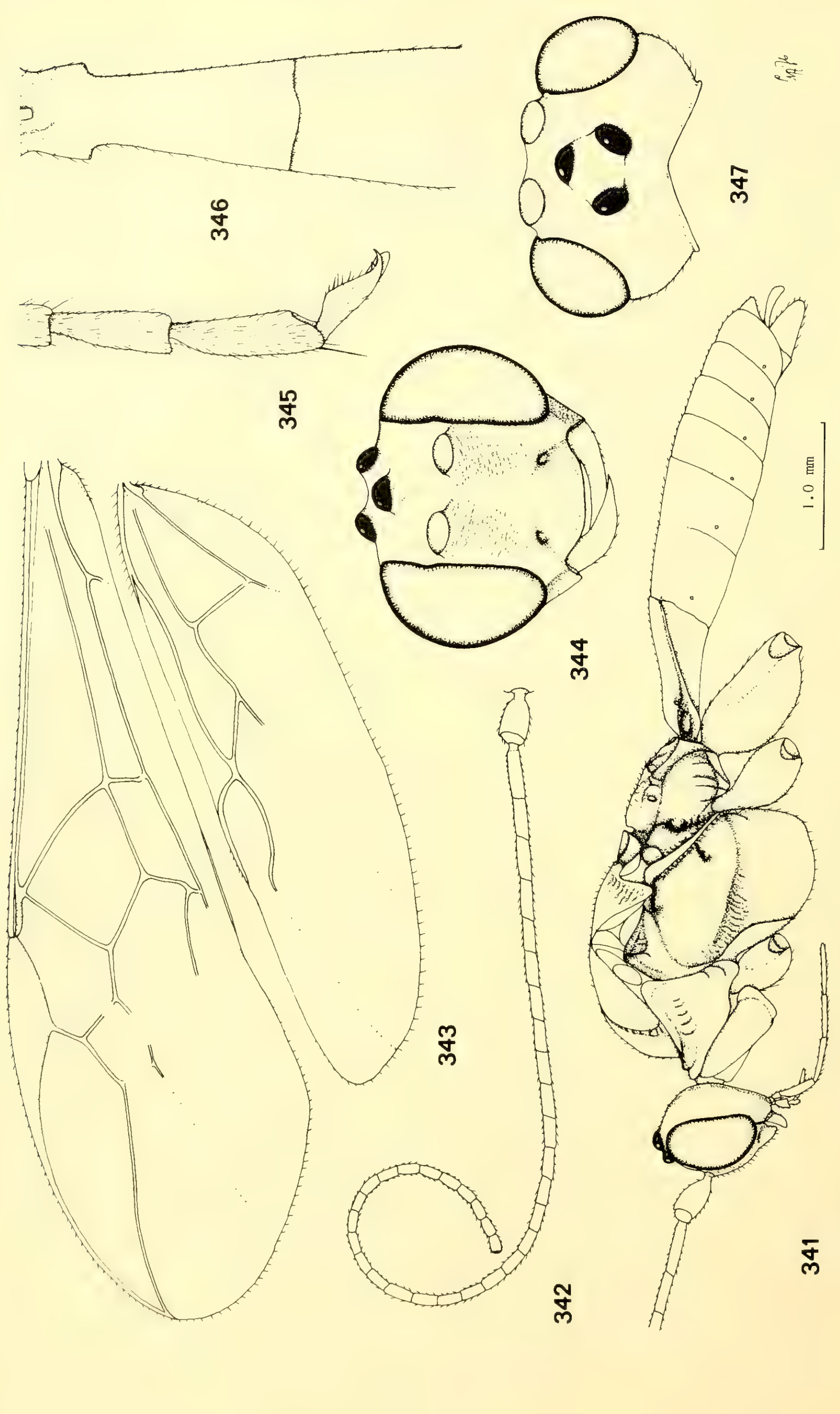
Figs. 315—318, *Homolobus (Phylacter) annulicornis* (Nees), neotype, but 317 of ♀ from Denmark, Klaekket. 315, 1st tergite, dorsal aspect; 316, mesonotum, dorsal aspect; 317, hind tibial spurs of ♀, lateral aspect; 318, hind leg. Figs. 319, 320, *Homolobus (Apatia) rufithorax* (Granger), lectotype. 319, hind leg: 320, 1st tergite, dorsal aspect. Figs. 321—323, *Homolobus (Phylacter) meridionalis* spec. nov., holotype. 321, head, dorsal aspect; 322, hind leg; 323, mesonotum, dorsal aspect. Figs. 324—326, *Homolobus (Apatia) truncatoides* spec. nov., holotype. 324, hind leg; 325, mesonotum, dorsal aspect; 326, 1st—3rd tergites, dorsal aspect. 315, 316, 320, 321, 323: 2.0 ×; 317—319, 322: scale-line, 1 ×; 324: 1.7 ×; 325, 326: 2.5 ×



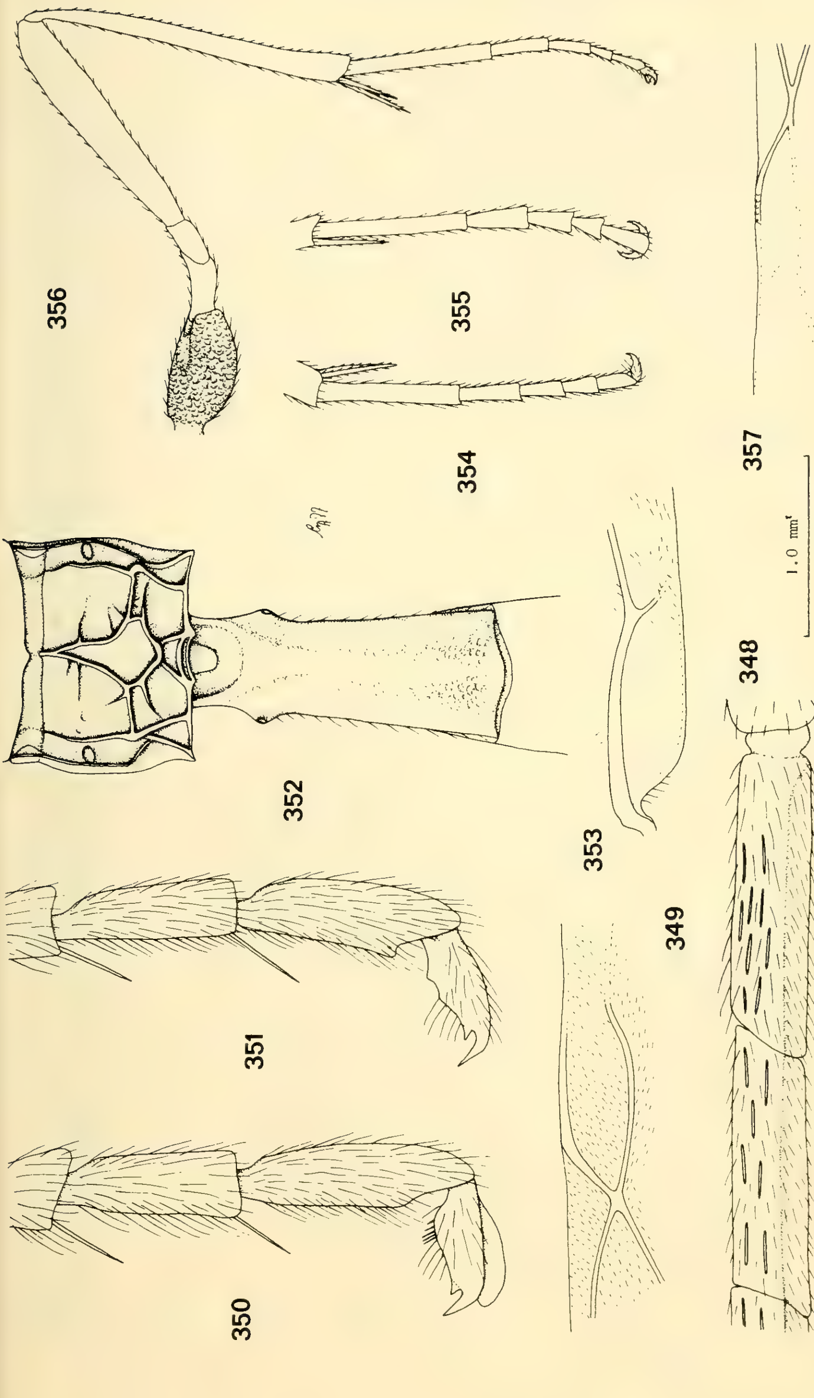
Figs. 327-331, *Homolobus (Apatia) pallidistigmus* (Cameron), holotype. 327, habitus (except metasoma), lateral aspect; 328, head, dorsal aspect; 329, wings; 330, head, frontal aspect; 331, head, dorsal aspect. 327, 329: scale-line, 1 ×; 328, 330: 1.9 ×; 331: 1.3 ×



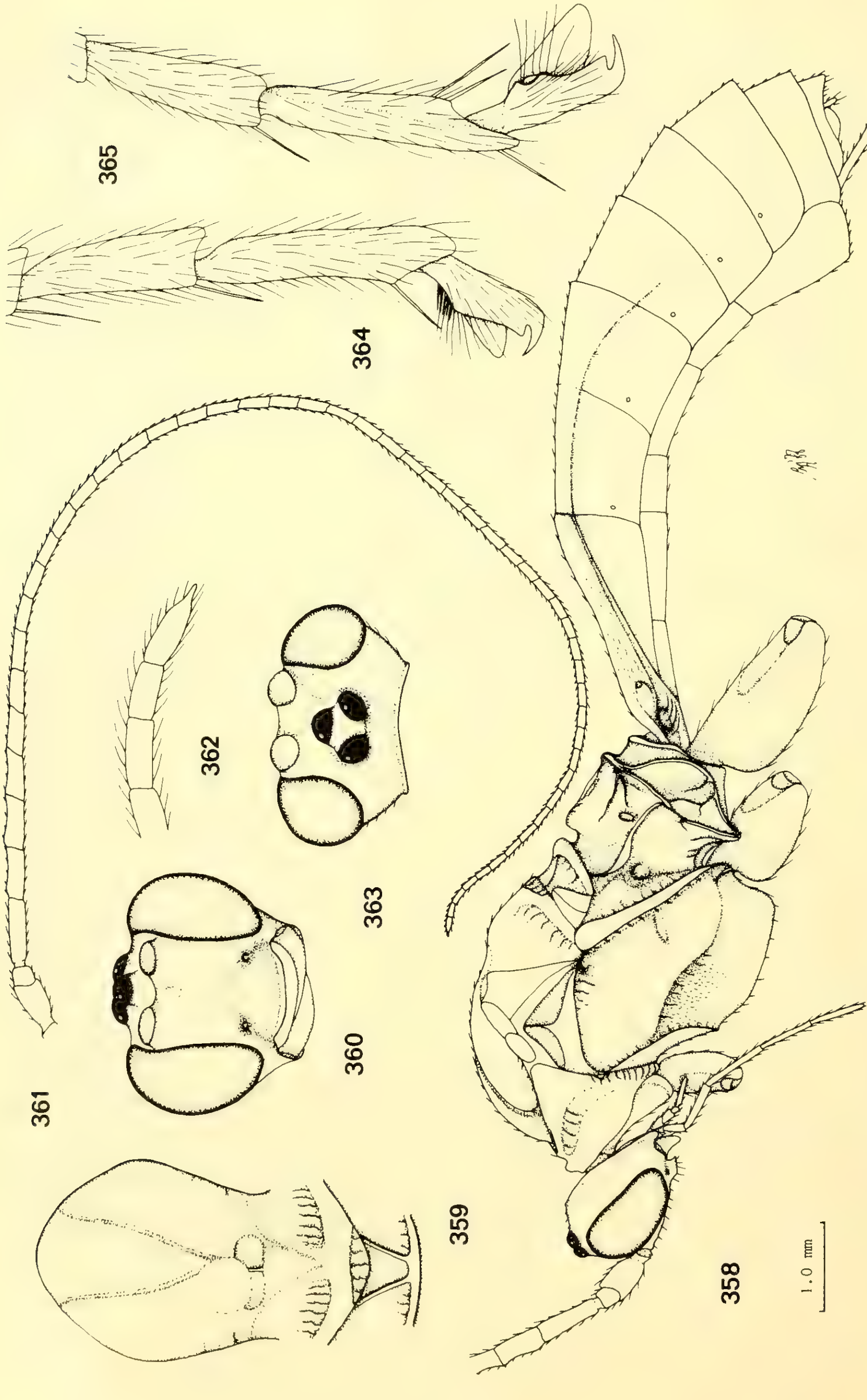
Figs. 332, 333, *Homolobus (Apatia) elagabalus* (Nixon), holotype. 332, mesonotum, dorsal aspect; 333, 1st tergite, dorsal aspect. Figs. 334—340, *Homolobus (Apatia) pallidistigmus* (Cameron), ♀, Zaire, Rutshuru. 334, 1st tergite, dorsal aspect; 335, metasoma, lateral aspect; 336, palpi; 337, detail of veins SC + R1 and SR of hind wing; 338, hind leg; 339, full sight on outer hind claw; 340, full sight on outer fore claw. 332—334, 336, 337: 2.0 ×; 335, 338: scale-line, 1 ×; 339, 340: 4.0 ×



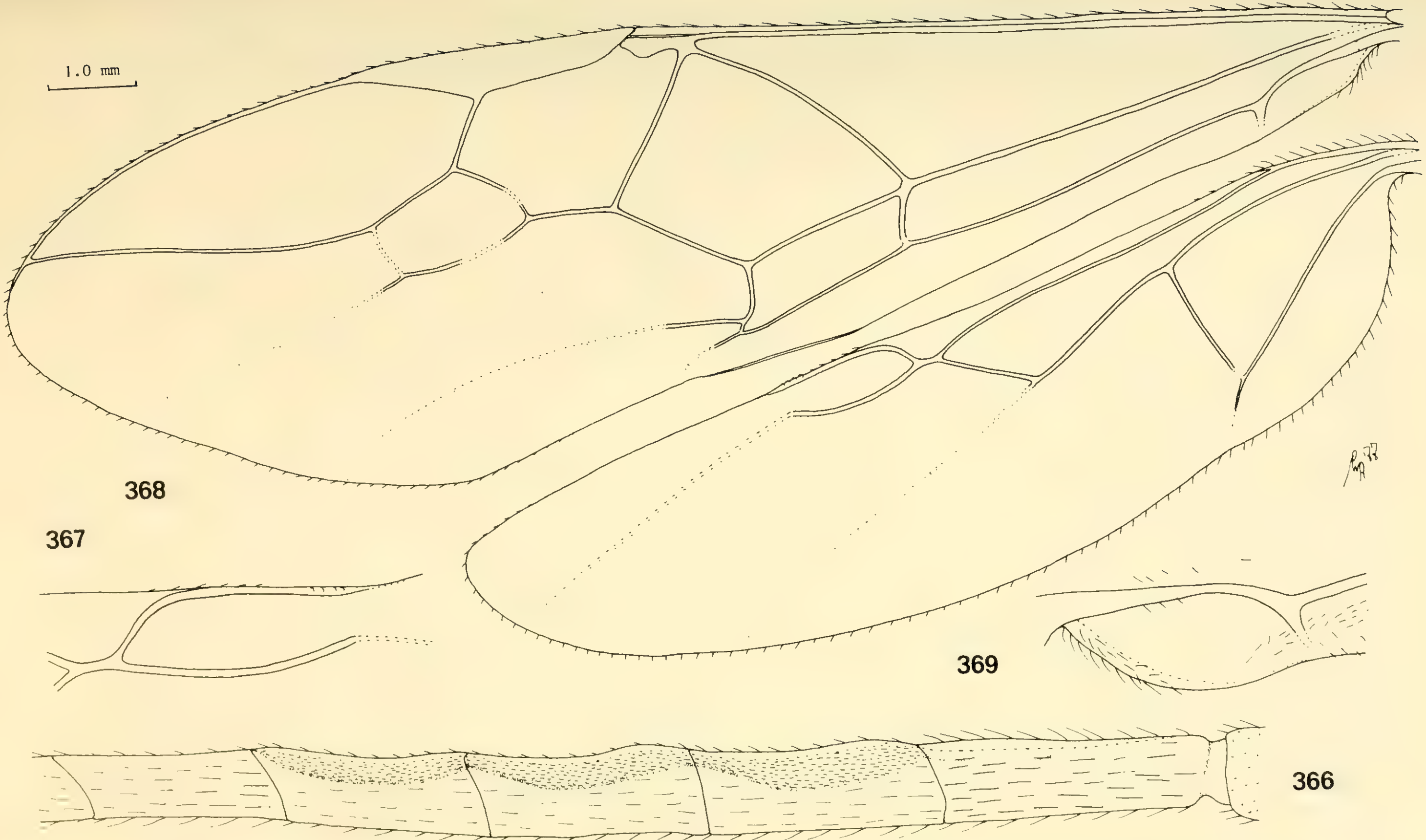
Figs. 341—347, *Homolobus (Chartolobus) wesmaeli* (Bengtsson), lectotype. 341, habitus, lateral aspect; 342, antenna; 343, wings; 344, head, frontal aspect; 345, inner fore claw; 346, 1st and 2nd tergites, dorsal aspect; 347, head, dorsal aspect. 341—343: scale-line, 1 ×; 344, 346, 347: 2.0 ×; 345: 5.0 ×



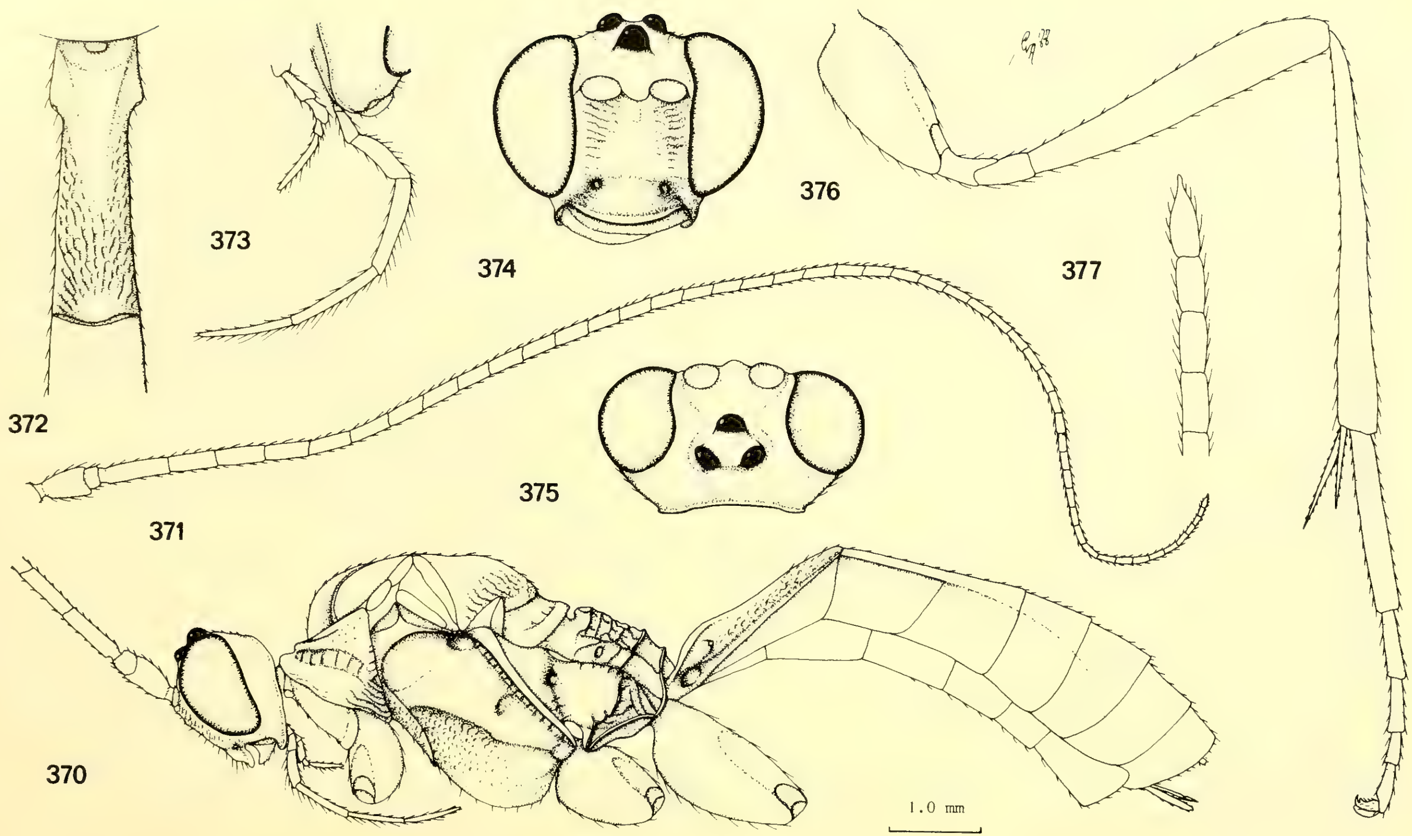
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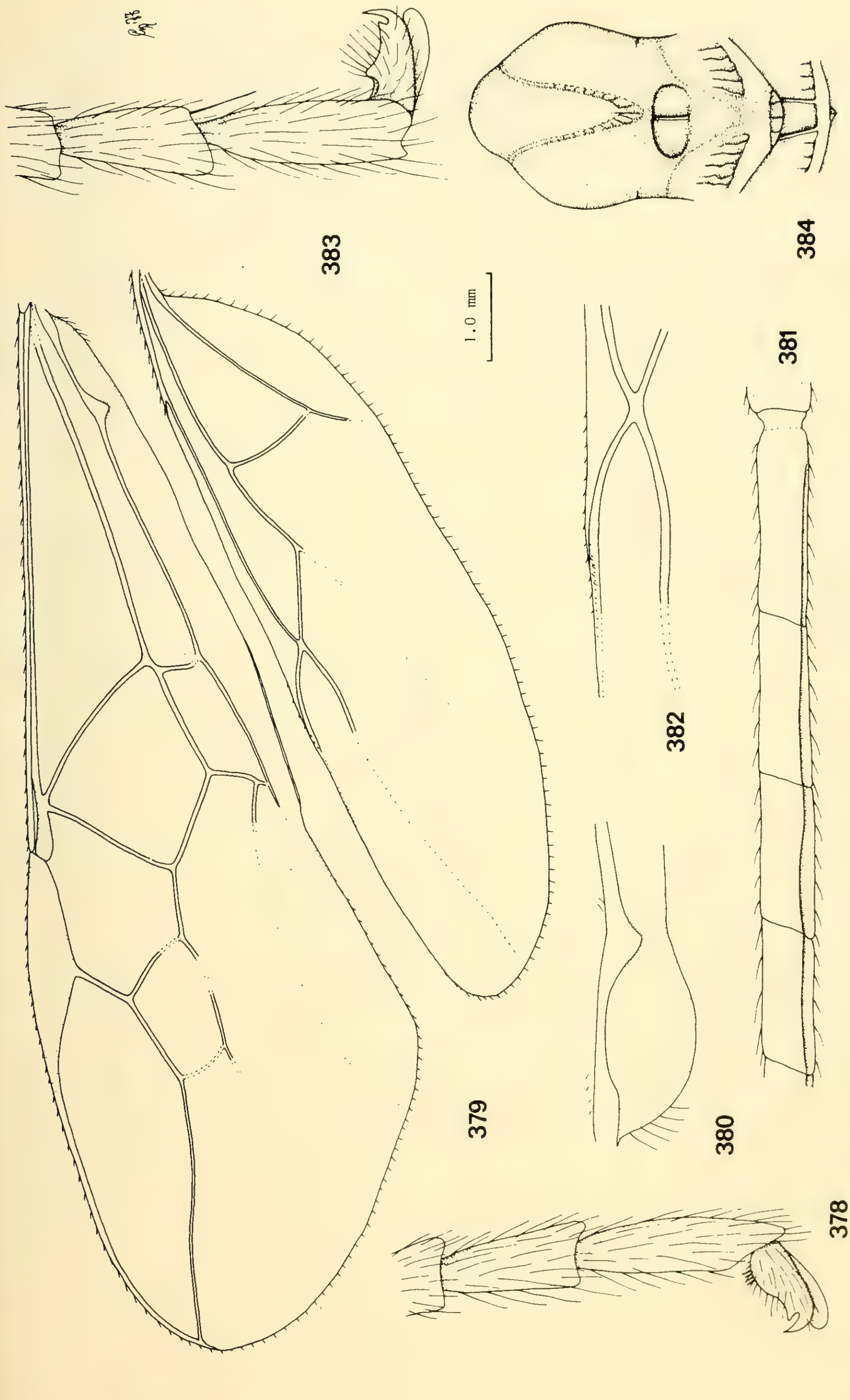
Figs. 358—365, *Homolobus (Chartolobus) undulatus* spec. nov., holotype. 358, habitus, lateral aspect; 359, mesonotum, dorsal aspect; 360, head, frontal aspect; 361, antenna; 362, apex of antenna; 363, head, dorsal aspect; 364, outer hind claw; 365, inner hind claw. 358, 361: scale-line, 1 ×; 359, 360, 363: 1.4 ×; 362, 364, 365: 5.0 ×



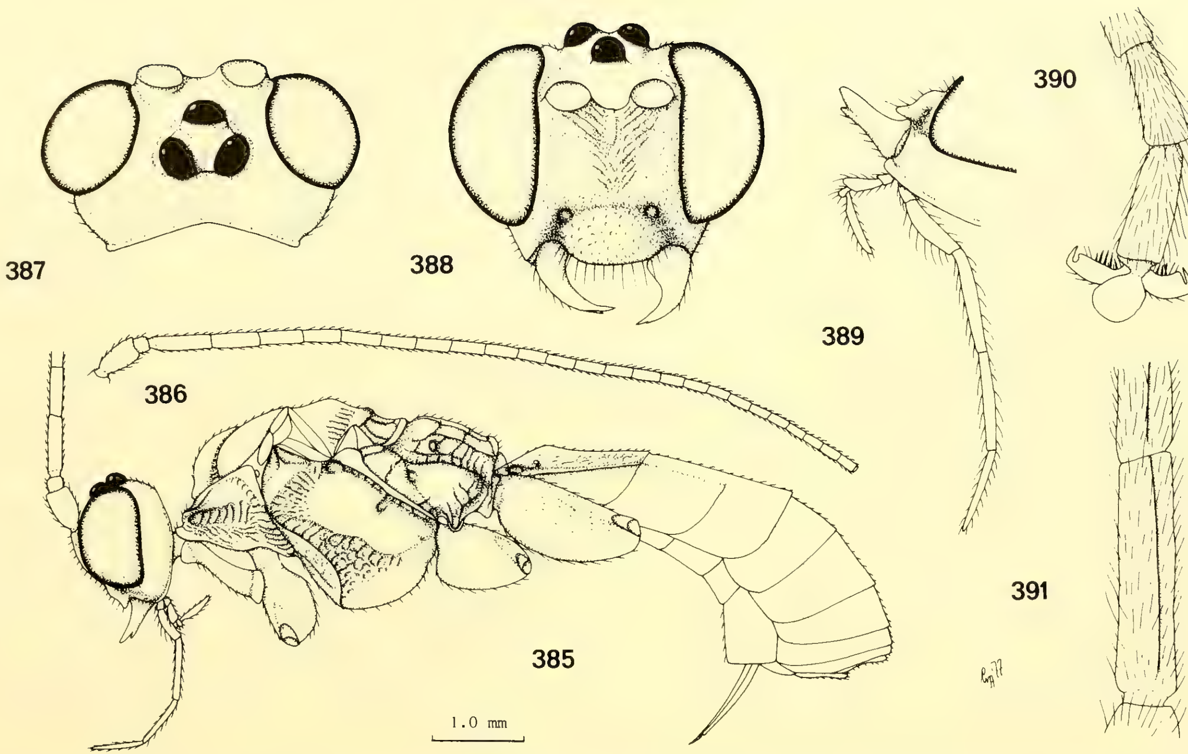
Figs. 366—369, *Homolobus (Chartolobus) undulatus* spec. nov., holotype. 366, 3rd—7th antennal segments, inner aspect; 367, detail of veins SC + R1 and SR of hind wing; 368, wings; 369, detail of vein 1A + 2A and 2A. 366: 5.0 ×; 367, 369: 2.0 ×; 368: scale-line, 1 ×



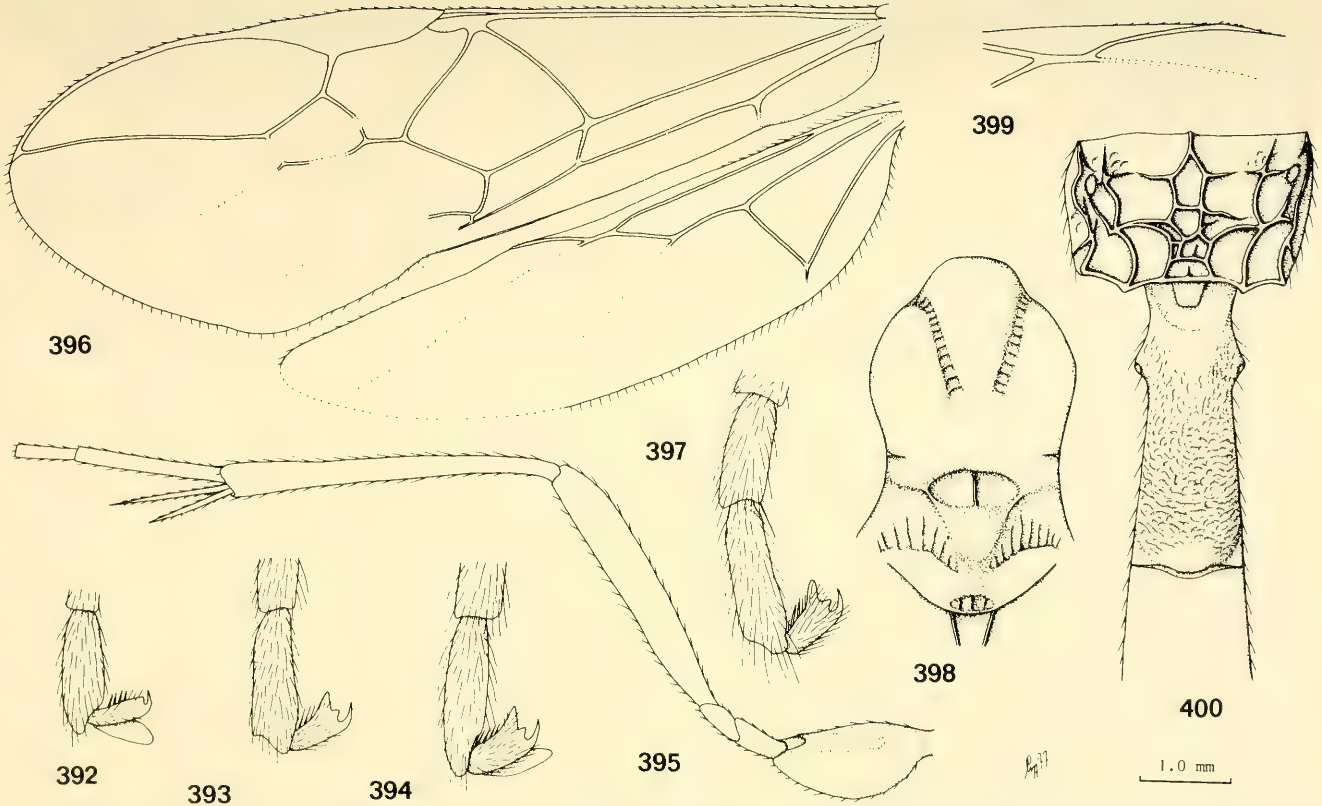
Figs. 370—377, *Homolobus (Chartolobus) nigritarsis* spec. nov., holotype. 370, habitus, lateral aspect; 371, antenna; 372, 1st tergite, dorsal aspect; 373, palpi; 374, head, frontal aspect; 375, head, dorsal aspect; 376, hind leg; 377, apex of antenna. 370, 371, 376: scale-line, 1 ×; 372, 374, 375: 1.3 ×; 373: 2.0 ×; 377: 5.0 ×



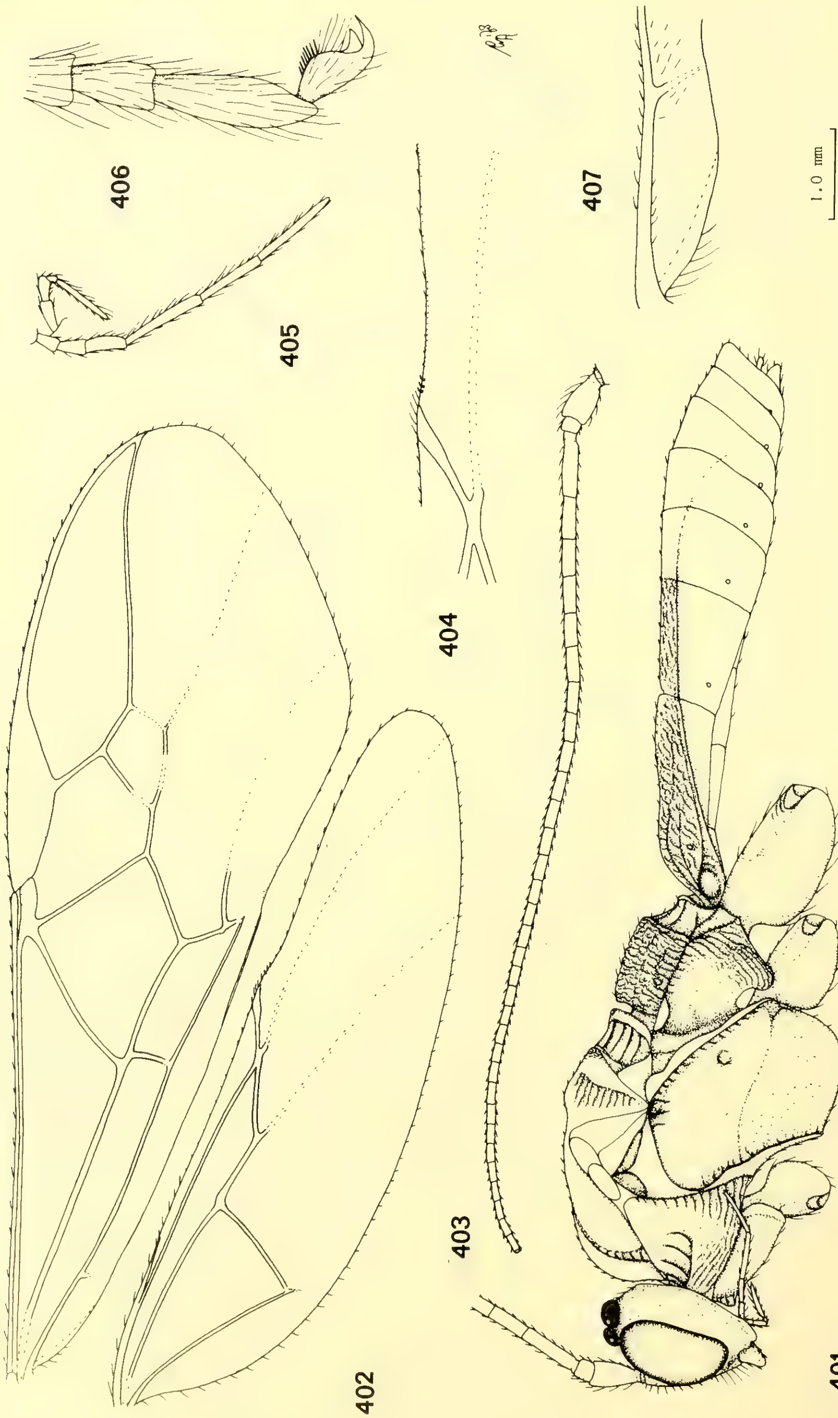
Figs. 378—384, *Homolobus (Chartolobus) nigritarsis* spec. nov., holotype. 378, outer hind claw; 379, wings; 380, detail of veins 1A + 2A of fore wing; 381, 3rd-6th antennal segments, inner aspect; 382, detail of veins SC + R1 and SR of hind wing; 383, inner hind claw; 384, mesonotum, dorsal aspect. 378, 383: 5.0 ×; 379: scale-line, 1 ×; 380, 382: 2.0 ×; 381: 3.0 ×



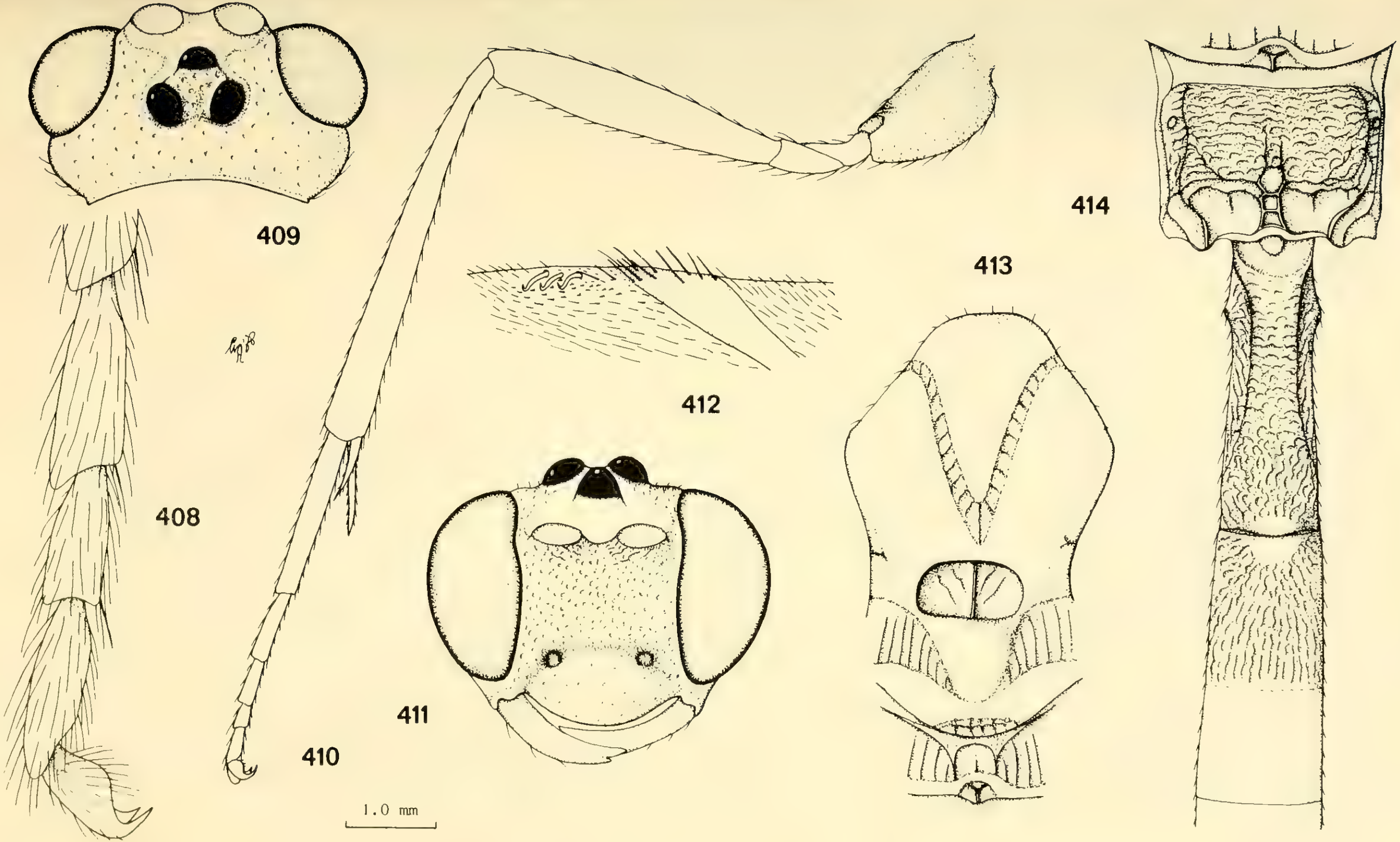
Figs. 385—391, *Homolobus (Homolobus) simplex* (Watanabe), holotype. 385, habitus, lateral aspect; 386, antenna; 387, head, dorsal aspect; 388, head, frontal aspect; 389, palpi; 390, middle claws, full sight on outer claw; 391, 3rd antennal segment, inner aspect. 385, 386: scale-line 1 ×; 387—389: 2.0 ×; 390, 391: 5.0 ×



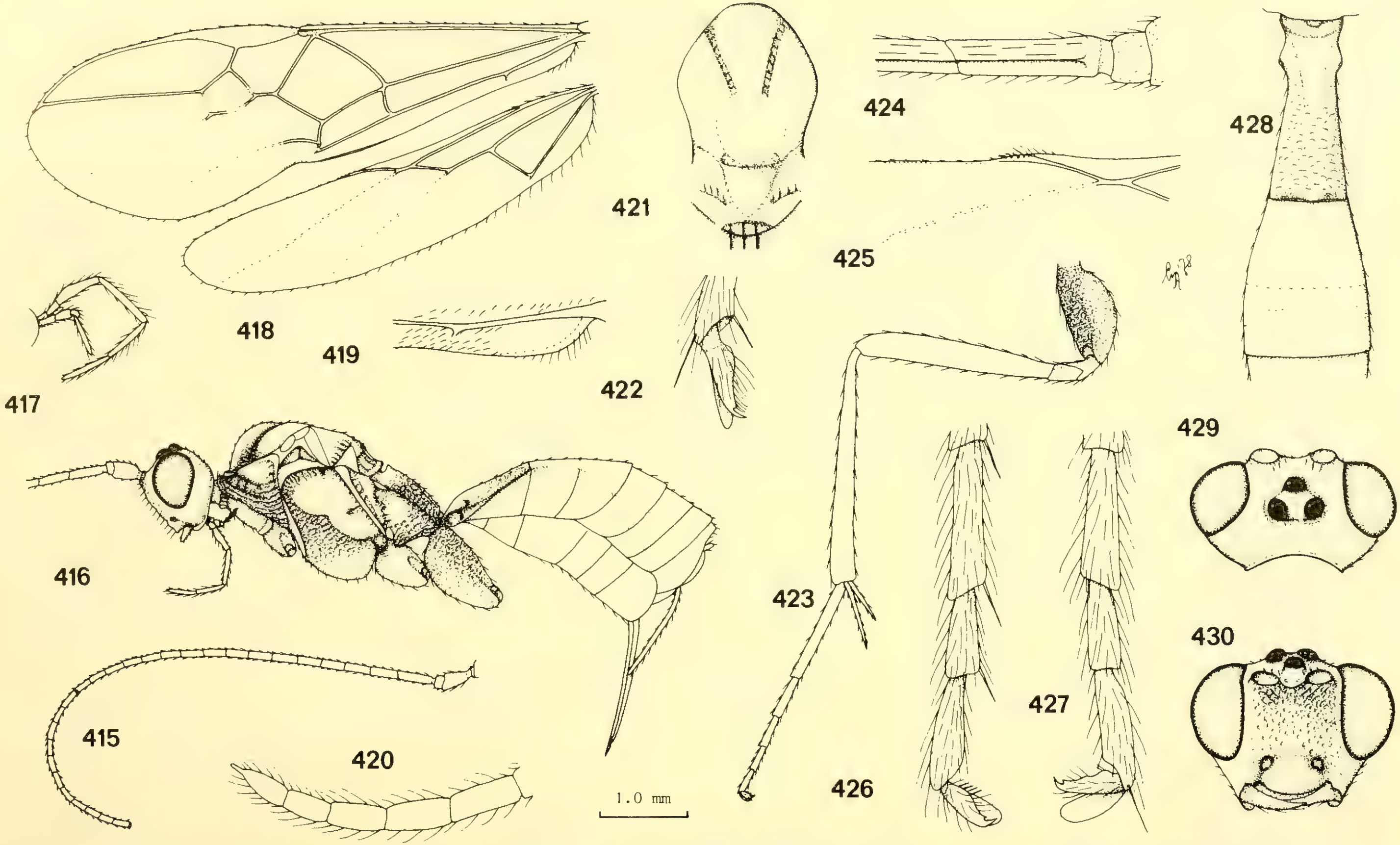
Figs. 392—400, *Homolobus (Homolobus) simplex* (Watanabe), holotype, but 392—394 and 397 of ♂, Japan, Hokkaido. 392, inner fore claw; 393, inner middle claw; 394, inner hind claw; 395, hind leg; 396, wings; 397, outer hind claw; 398, mesonotum, dorsal aspect; 399, detail of veins 1A + 2A and SR; 400, propodeum and 1st tergite, dorsal aspect. 392—394, 397: 5.0 × ; 395, 396: scale-line, 1 × ; 398—400: 2.0 ×



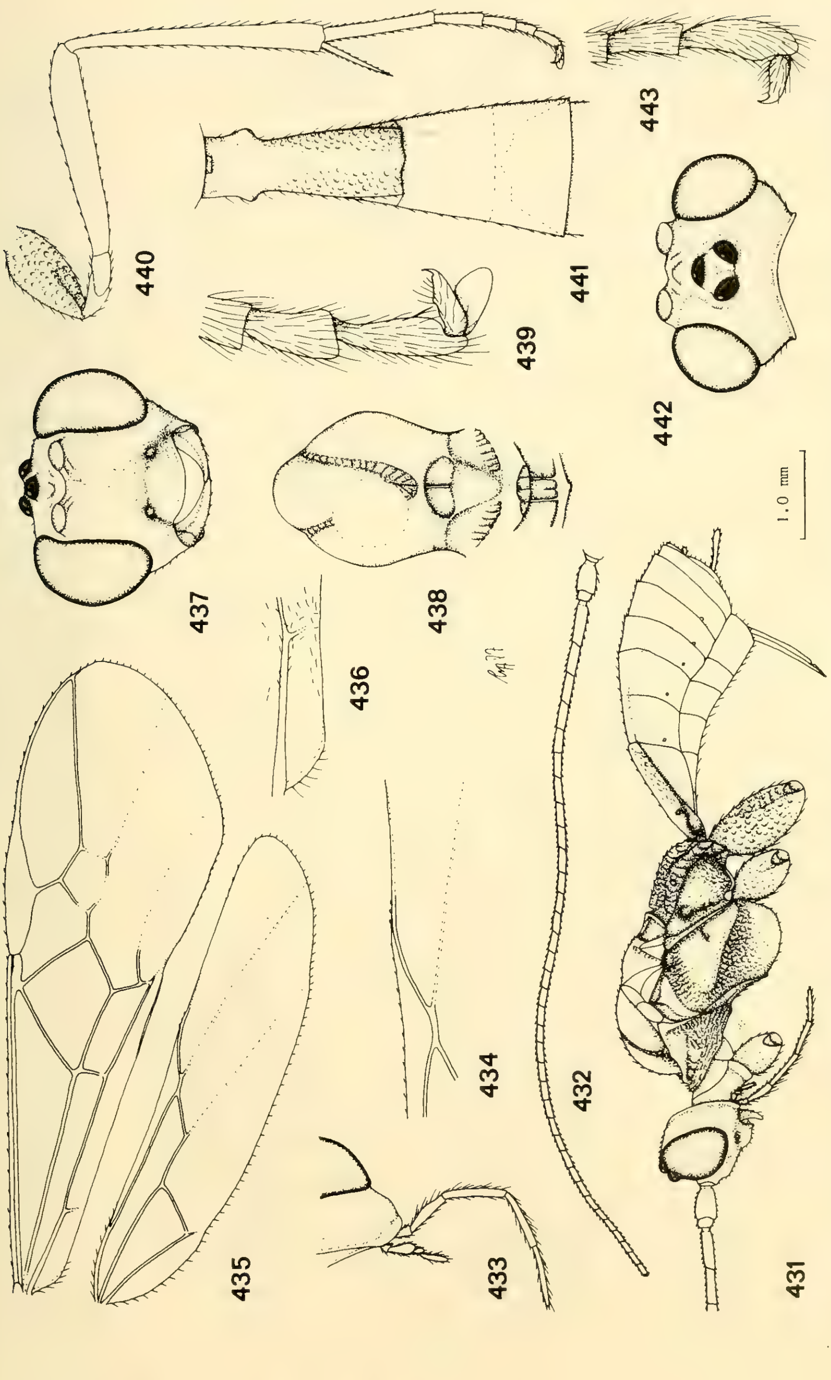
Figs. 401—407, *Homolobus (Homolobus) rugosus* spec. nov., holotype. 401, habitus, lateral aspect; 402, wings; 403, antenna; 404, detail of veins SC + R1 and SR of hind wing; 405, palpi; 406, inner fore claw; 407, detail of vein 1A + 2A of fore wing. 401—403: scale-line, 1 ×; 404, 405, 407: 2.0 ×; 406: 5.0 ×



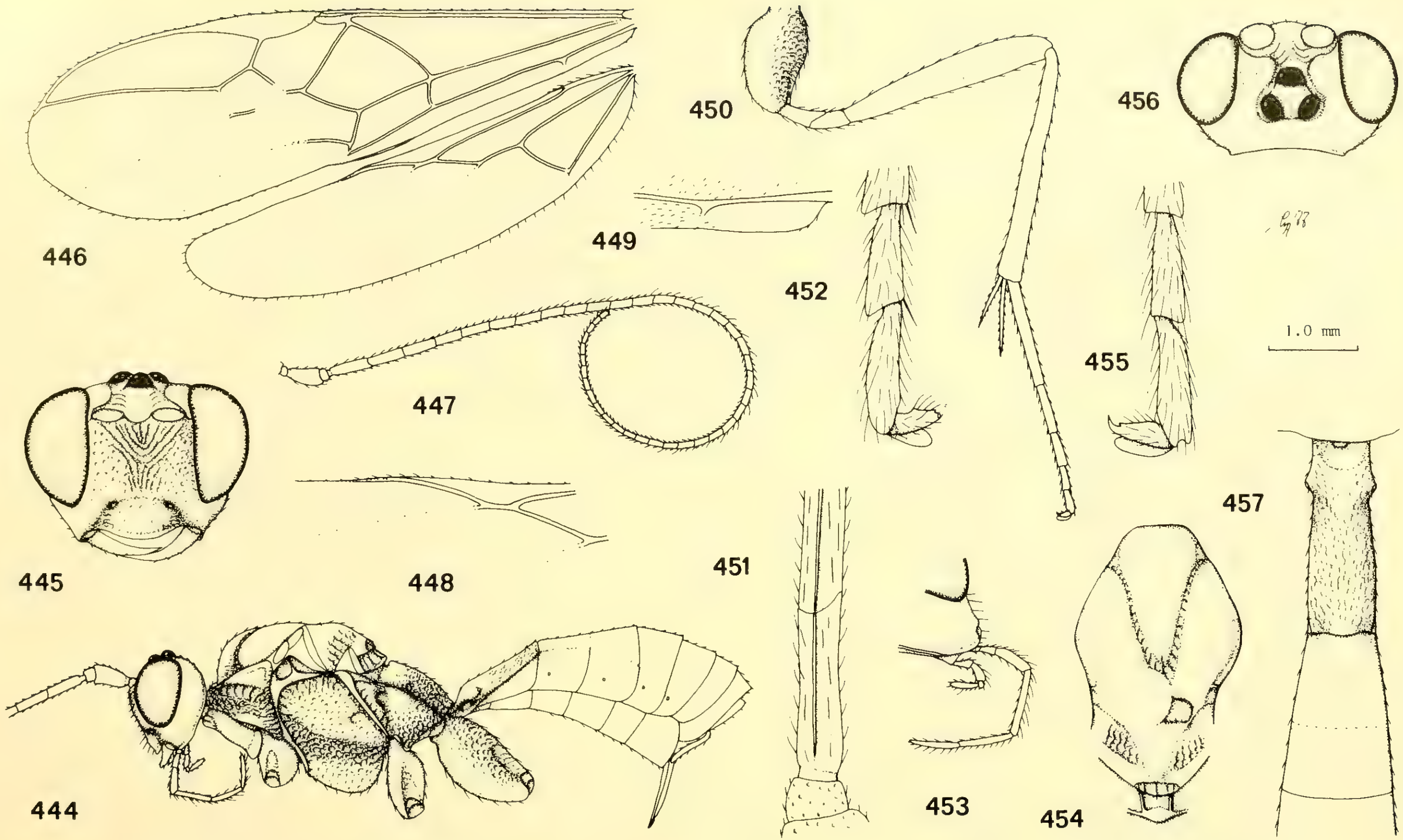
Figs. 408—414, *Homolobus (Homolobus) rugosus* spec. nov., holotype. 408, inner hind claw; 409, head, dorsal aspect; 410, hind leg; 411, head, frontal aspect; 412, detail of hamuli and vein SC + R1 of hind wing; 413, mesonotum, dorsal aspect; 414, propodeum and 1st—3rd tergites, dorsal aspect. 408, 412: 5.0 ×; 409, 411, 413: 2.0 ×; 414: 1.4 ×; 410: scale-line, 1 ×



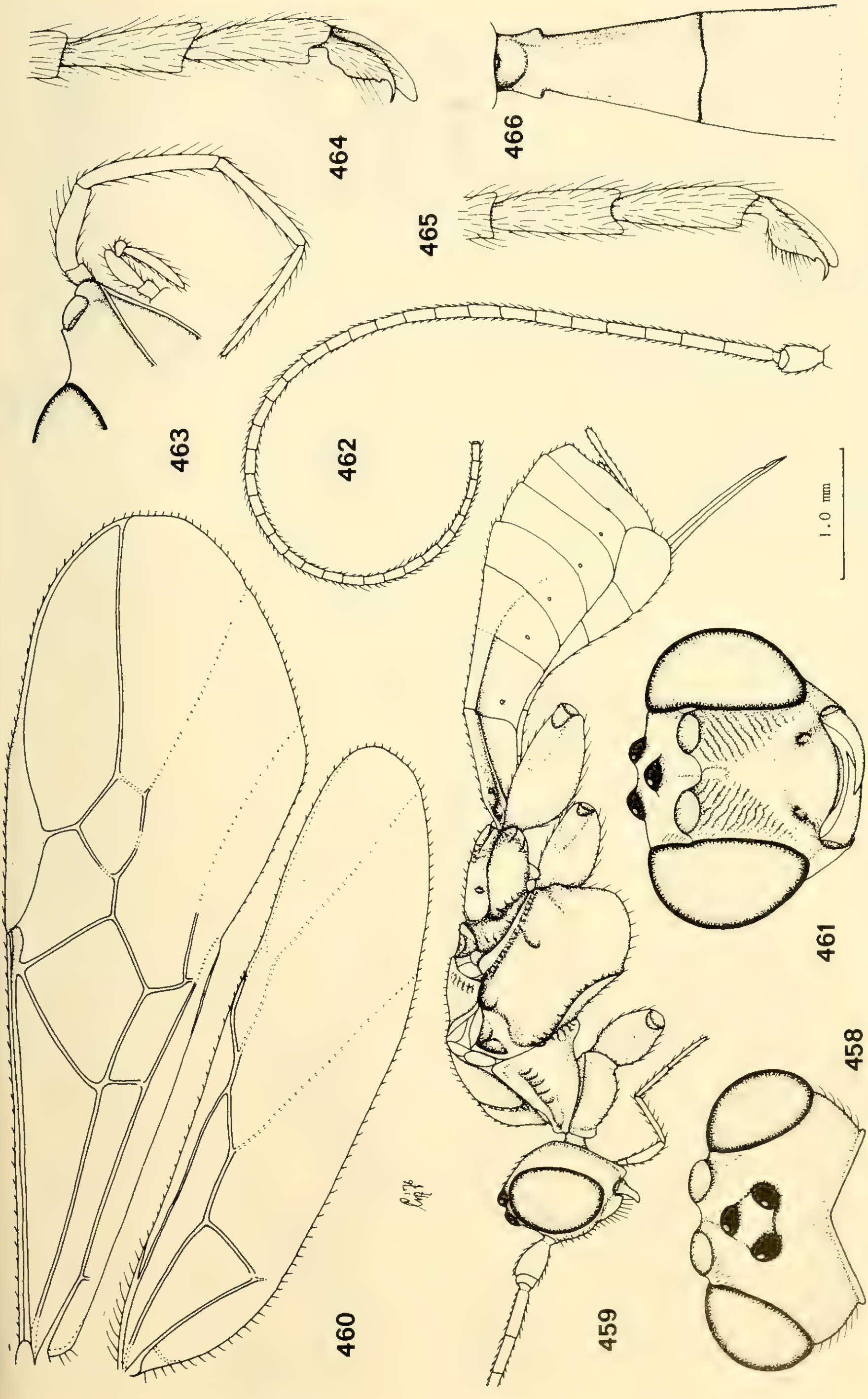
Figs. 415—430, *Homolobus (Homolobus) cingulatus* (Granger), lectotype, but 420 after ♀ from Andranotobaka and 422 after ♂ from Ampitameloka. 415, antenna; 416, habitus, lateral aspect; 417, palpi; 418, wings; 419, detail of vein 1A + 2A of fore wing; 420, apex of antenna; 421, mesonotum, dorsal aspect; 422, inner hind claw of ♂; 423, hind leg; 424, detail of 3rd antennal segment, inner aspect; 425, detail of veins SC + R1 and SR of hind wing; 426, outer hind claw; 427, inner hind claw; 428, 1st—3rd tergites, dorsal aspect; 429, head, dorsal aspect; 430, head, frontal aspect. 415, 416, 418, 423: scale-line, 1 ×; 417, 419, 421, 425, 428—430: 2.0 ×; 420: 6.2 ×; 422, 424, 426, 427: 5.0 ×



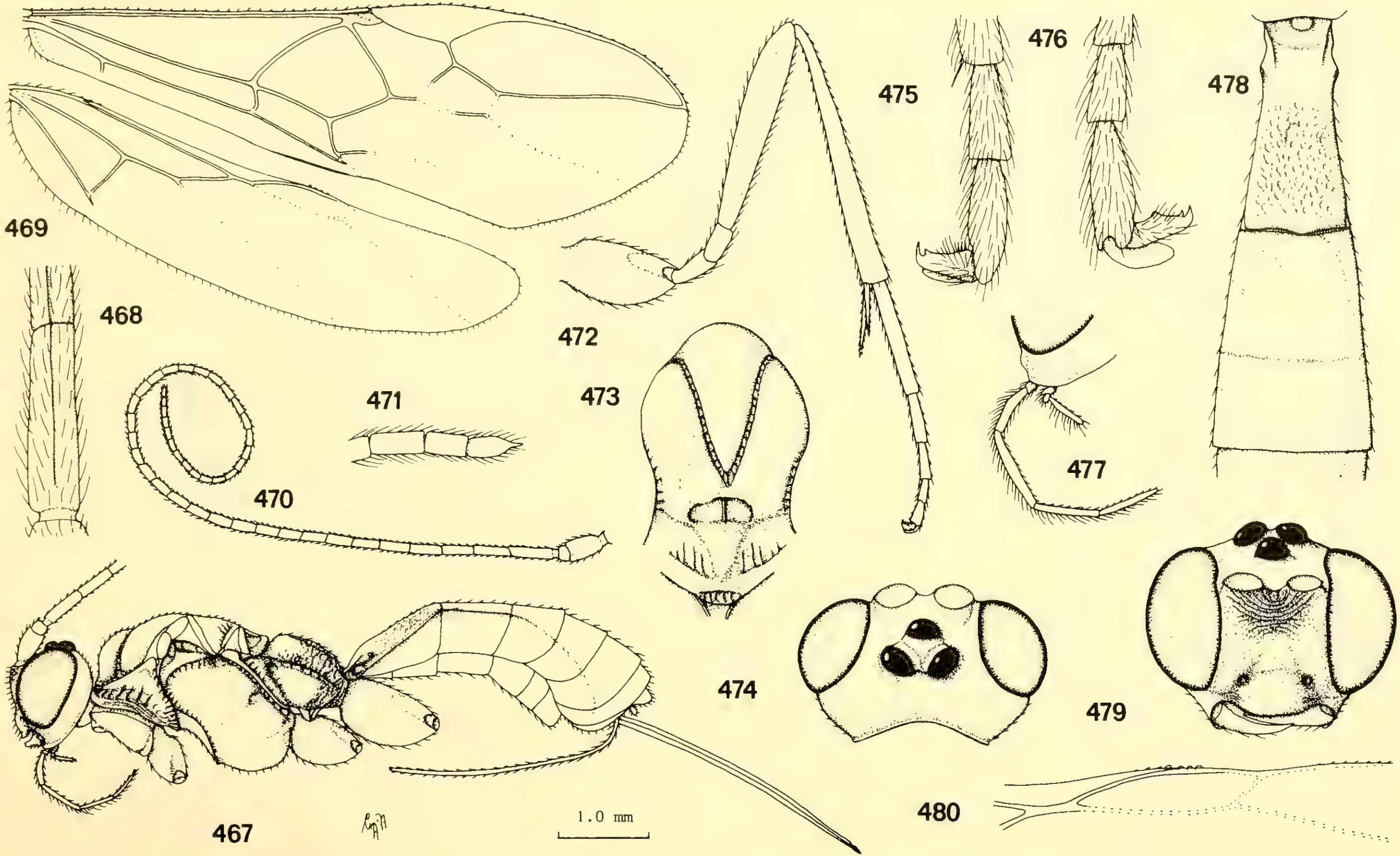
Figs. 431—443, *Homolobus (Homolobus) inopinus* spec. nov., holotype. 431, habitus, lateral aspect; 432, antenna; 433, palpi; 434, detail of veins SC + R1 and SR of hind wing; 435, wings; 436, detail of veins 1A + 2A and 2A of fore wing; 437: head, frontal aspect; 438: mesonotum, dorsal aspect; 439, inner hind claw; 440, hind leg; 441, 1st—3rd tergites, dorsal aspect; 442, head, dorsal aspect; 443, inner middle claw. 431, 432, 435, 440: scale-line, 1 ×; 433, 434, 436—438, 441, 442: 2.0 ×; 439, 443: 5.0 ×



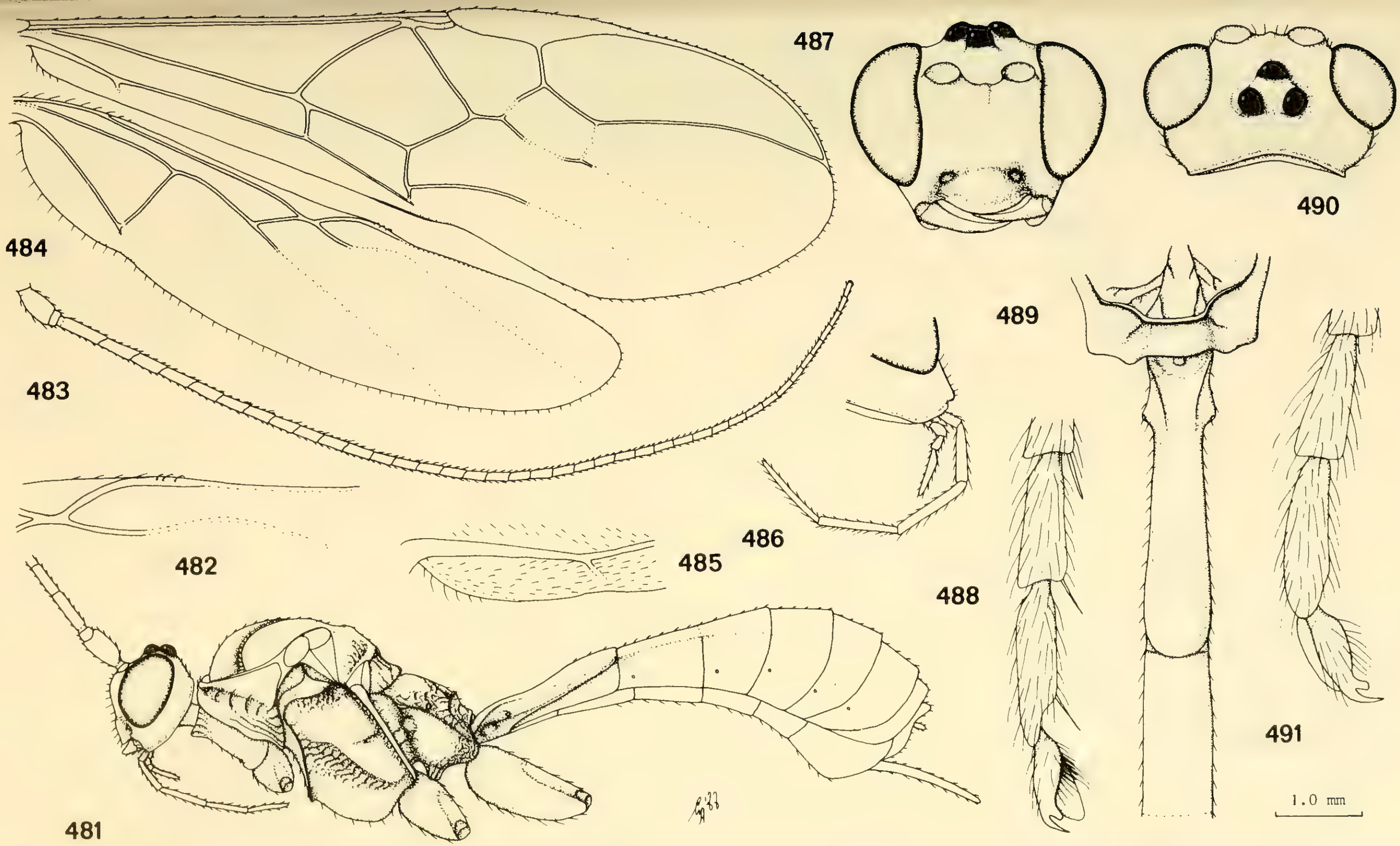
Figs. 444—457, *Homolobus (Homolobus) ethiopicus* spec. nov., holotype. 444, habitus, lateral aspect; 445, head, frontal aspect; 446, wings; 447, antenna; 448, detail of veins SC + R1 and SR of hind wing; 449, detail of veins 1A + 2A and 2A of fore wing; 450, hind leg; 451, 2nd-4th antennal segments, inner aspect; 452, inner hind claw; 453, palpi; 454, mesonotum, dorsal aspect; 455, outer; hind claw; 456, head, dorsal aspect; 457, 1st—3rd tergites, dorsal aspect. 444, 446, 450: scale-line, 1 ×; 445, 448, 449, 453, 454, 456, 457: 2.0 ×; 451, 452, 455: 5.0 ×



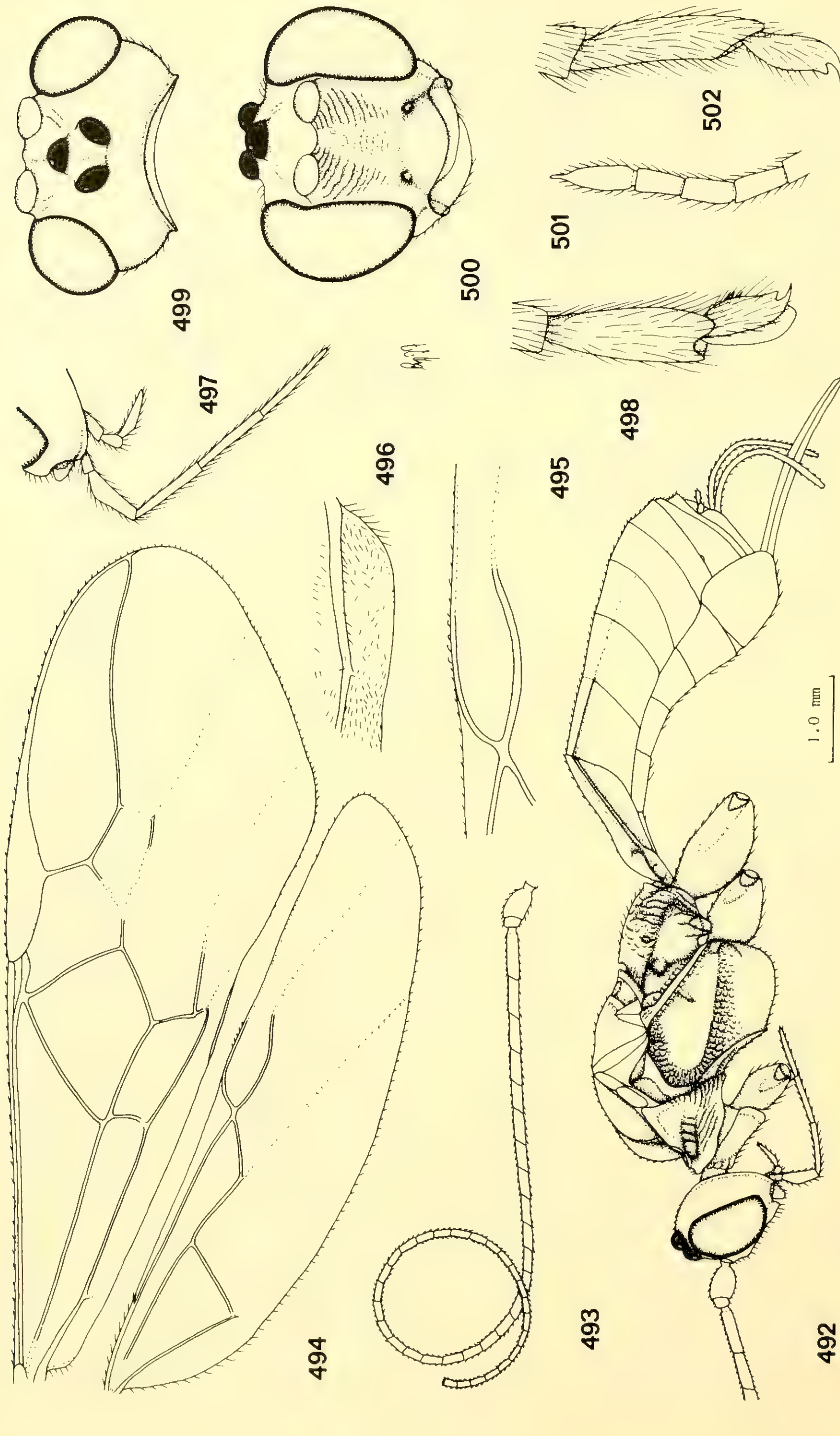
Figs. 458—466, *Homolobus (Homolobus) discolor* (Wesmael), lectotype. 458, head, dorsal aspect; 459, habitus, lateral aspect; 460, wings; 461, head, frontal aspect; 462, antenna; 463, palpi; 464, outer hind claw; 465, inner hind claw; 466, 1st and 2nd tergites, dorsal aspect. 458, 461, 466: 2.0 ×; 459, 460, 462: scale-line, 1 ×; 463: 3.0 ×; 464, 465: 4.3 ×



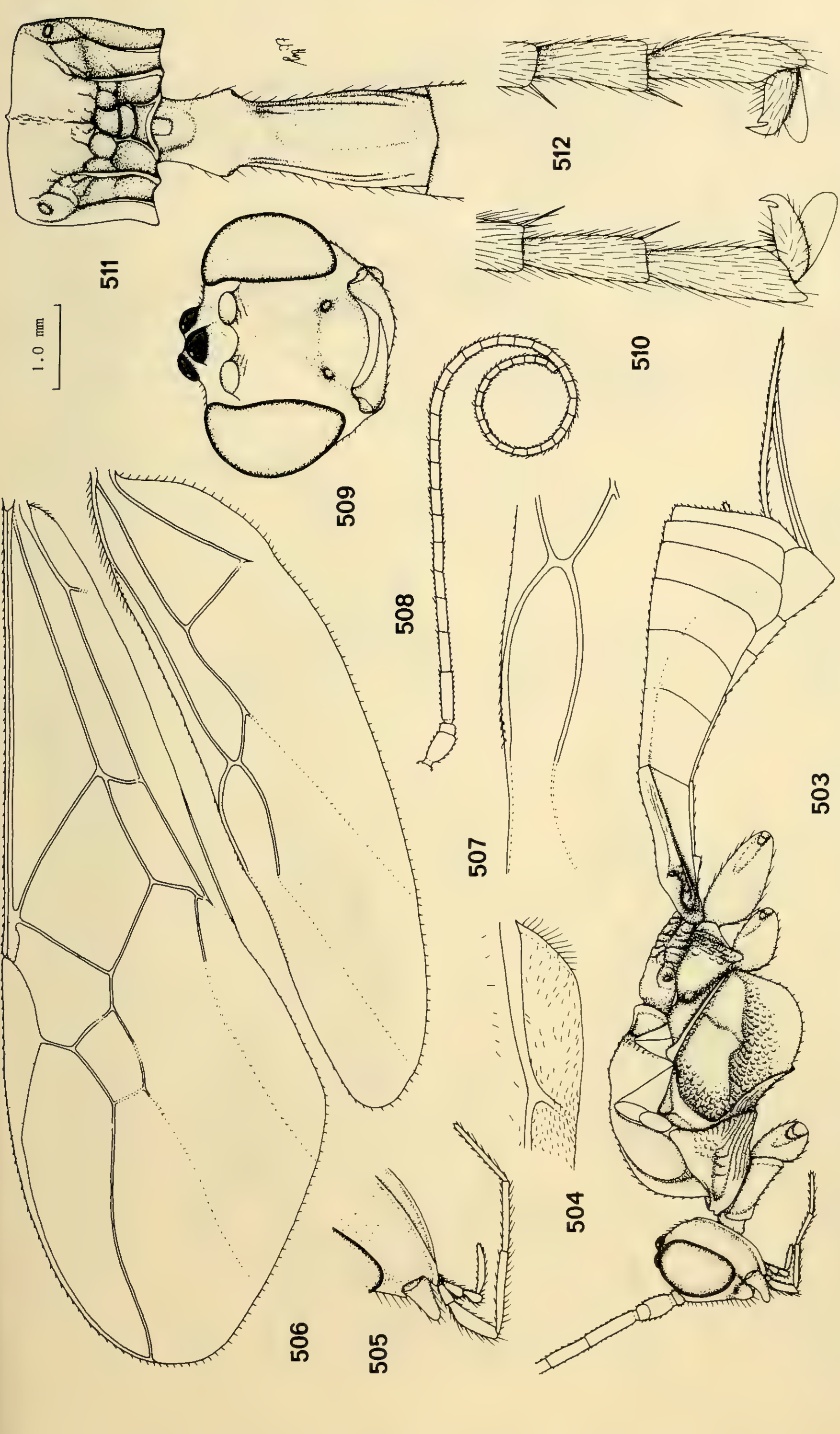
Figs. 467—480, *Homolobus (Homolobus) dauricus* Shestakov, holotype. 467, habitus, lateral aspect; 468, 3rd antennal segment, inner aspect; 469, wings; 470, antenna; 471, apex of antenna; 472, hind leg; 473, mesonotum, dorsal aspect; 474, head, dorsal aspect; 475, outer hind claw; 476, inner hind claw; 477, palpi; 478, 1st—3rd tergites, dorsal aspect; 479, head, frontal aspect; 480, detail of veins SC + R1 and SR of hind wing. 467, 469, 470, 472: scale-line, 1 ×; 468, 471, 475, 476: 5.0 ×; 473, 474, 477—480: 2.0 ×



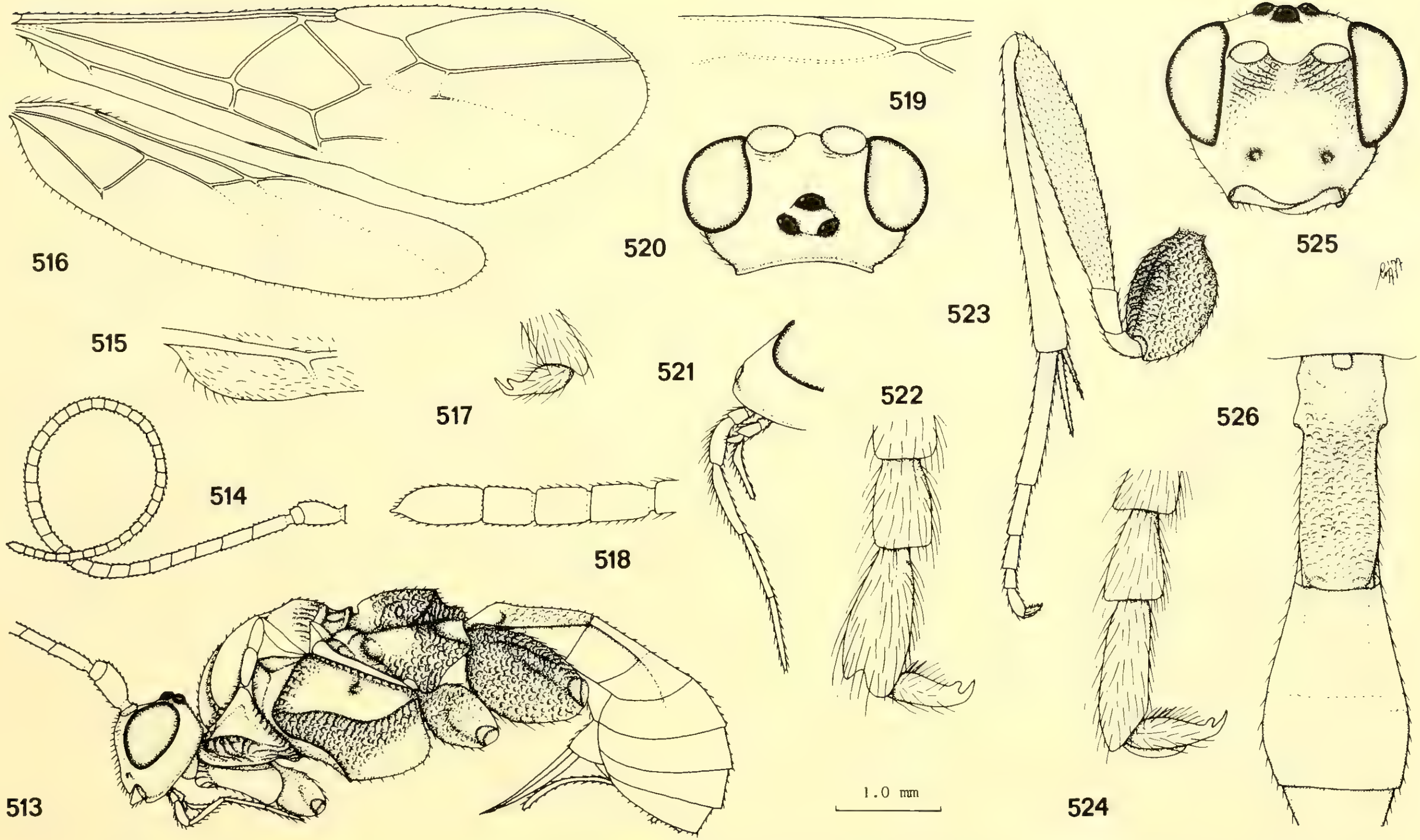
Figs. 481—491, *Homolobus (Phylacter) bifurcatus* spec. nov., holotype. 481, habitus, lateral aspect; 482, detail of veins SC + R1 and SR of hind wing; 483, antenna; 484, wings; 485, detail of veins 1A + 2A and 2A of fore wing; 486, palpi; 487, head, frontal aspect; 488, outer hind claw; 489, 1st and 2nd tergites, dorsal aspect; 490, head, dorsal aspect; 491, inner hind claw. 481, 483, 484: scale-line, 1 ×; 482, 485, 487, 489, 490: 2.0 ×; 488, 491: 5.0 ×



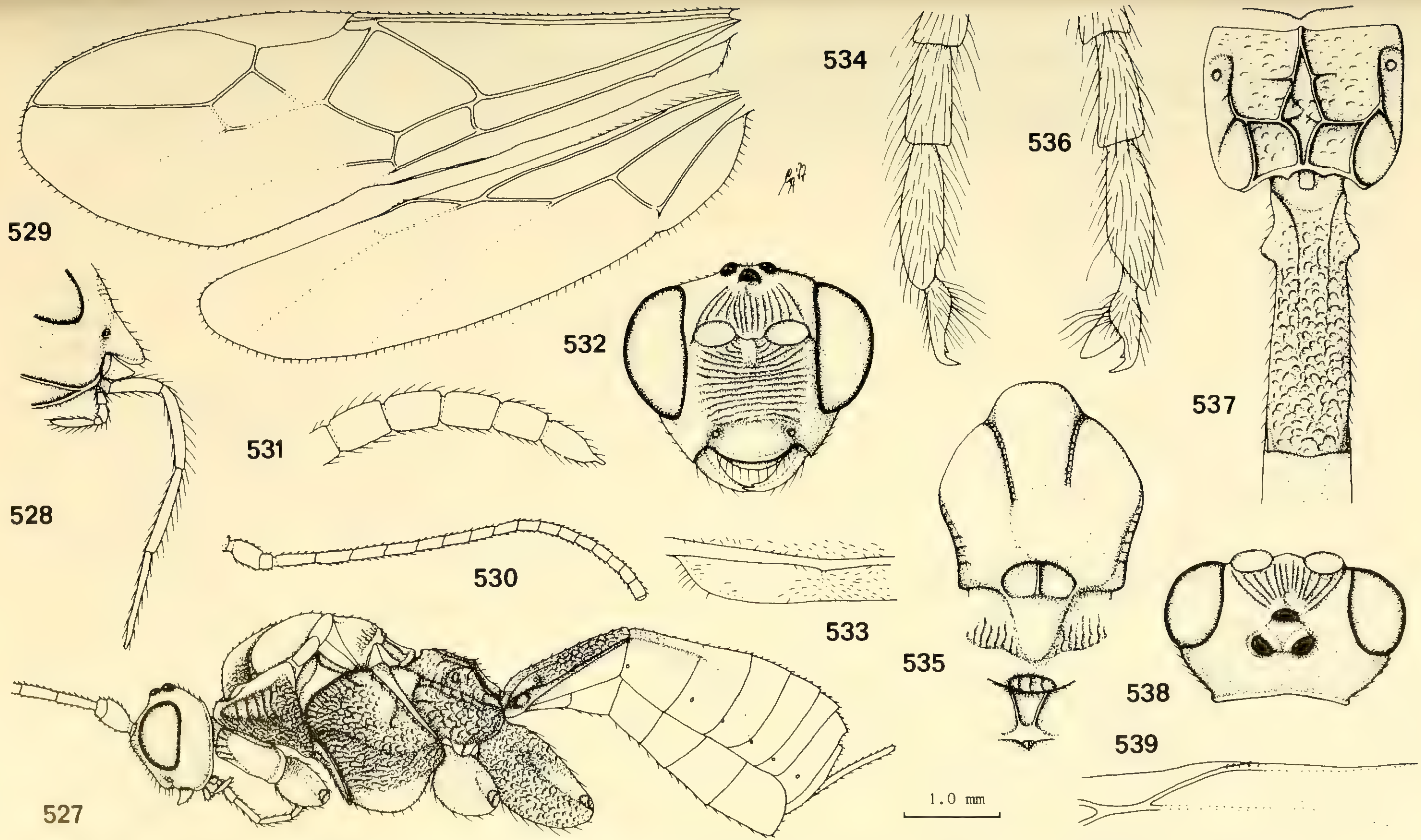
Figs. 492—502, *Homolobus (Phylacter) annulicornis* (Nees), neotype, but 501 of ♀ from Denmark, Klaekket. 492, habitus, lateral aspect; 493, antenna; 494, wings; 495, detail of veins SC + R1 and SR of hind wing; 496, detail of veins 1A + 2A and 2A of fore wing; 497, palpi; 498, outer hind claw; 499, head, dorsal aspect; 500, head, frontal aspect; 501, apex of antenna; 502, inner hind claw. 492—494: scale-line, 1 ×; 495—497, 499, 500: 2.0 ×; 498, 501, 502: 5.0 ×



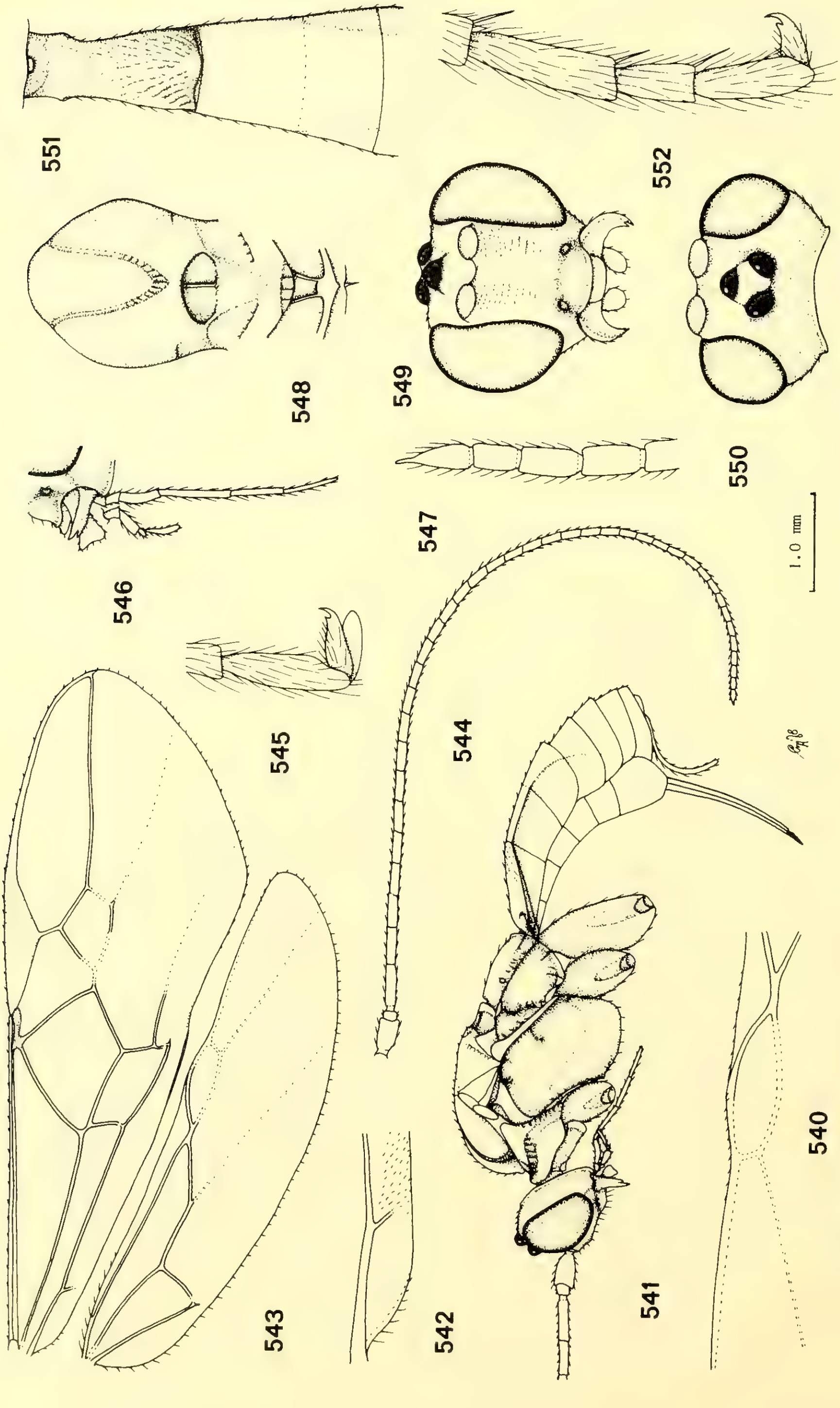
Figs. 503—512, *Homolobus (Phylacter) meridionalis* spec. nov., holotype. 503, habitus, lateral aspect; 504, detail of veins 1A + 2A and 2A of fore wing; 505, palpi; 506, wings; 507, detail of SC + R1 and SR of hind wing; 508, antenna; 509, head, frontal aspect; 510, outer hind claw; 511, propodeum and 1st tergite, dorsal aspect; 512, inner hind claw. 503, 506, 508: scale-line, 1 ×; 504, 505, 507, 509, 511: 2.0 ×; 510, 512: 5.0 ×



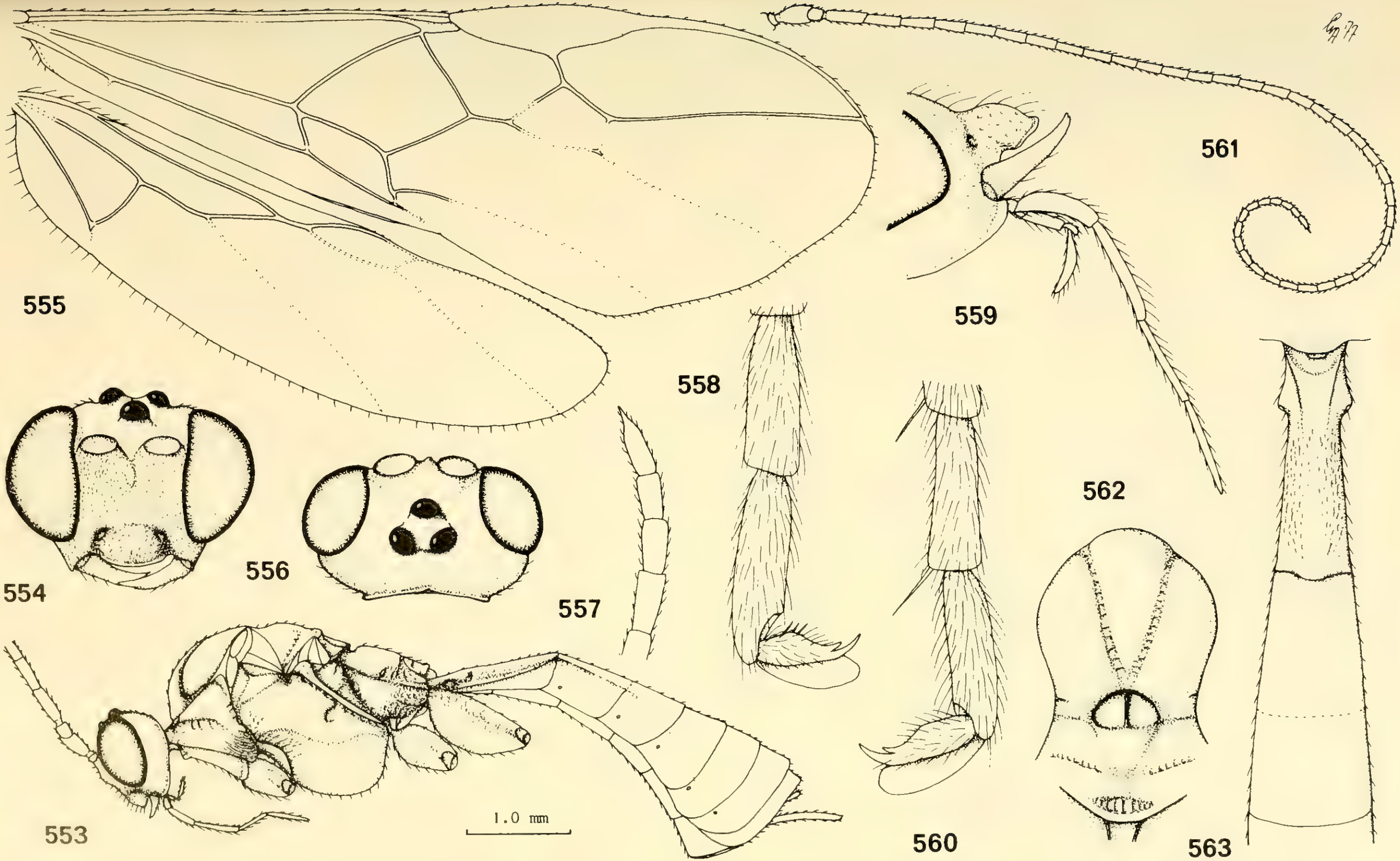
Figs. 513—526, *Homolobus (Oulophus) carbonator* (Shestakov), holotype. 513, habitus, lateral aspect; 514, antenna; 515, detail of veins 1A + 2A and 2A of fore wing; 516, wings; 517, inner fore claw; 518, apex of antenna; 519, detail of veins SC + R1 and SR of hind wing; 520, head, dorsal aspect; 521, palpi; 522, outer hind claw; 523, hind leg; 524, inner hind claw; 525, head, frontal aspect; 526, 1st—3rd tergites, dorsal aspect. 513, 514, 516, 523: scale-line, 1 ×; 515, 519—521, 525, 526: 2.0 ×; 517, 518, 522, 524: 5.0 ×



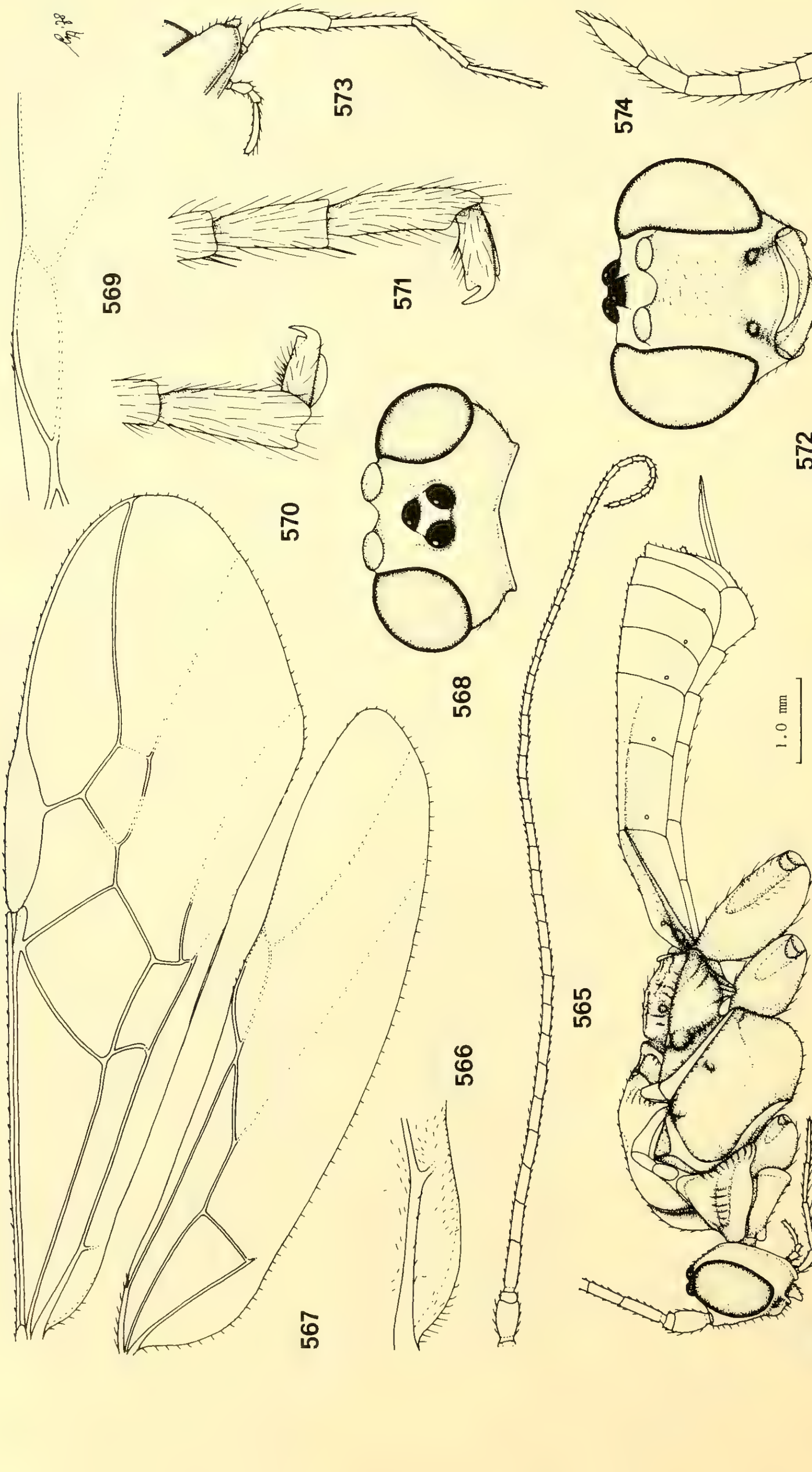
Figs. 527—539, *Homolobus (Oulophus) bohemani* (Bengtsson), holotype, but 531 after ♀ from Finland, Parikkala. 527, habitus, lateral aspect; 528, palpi; 529, wings; 530, antenna; 531, apex of antenna; 532, head, frontal aspect; 533, detail of veins 1A + 2A and 2A of fore wing; 534, inner hind claw; 535, mesonotum, dorsal aspect; 536, outer hind claw; 537, propodeum and 1st tergite, dorsal aspect; 538, head, dorsal aspect; 539, detail of veins SC + R1 and SR of hind wing. 527, 529, 530: scale-line, 1 ×; 528, 532, 533, 535, 537—539: 2.0 ×; 531, 534, 536: 5.0 ×



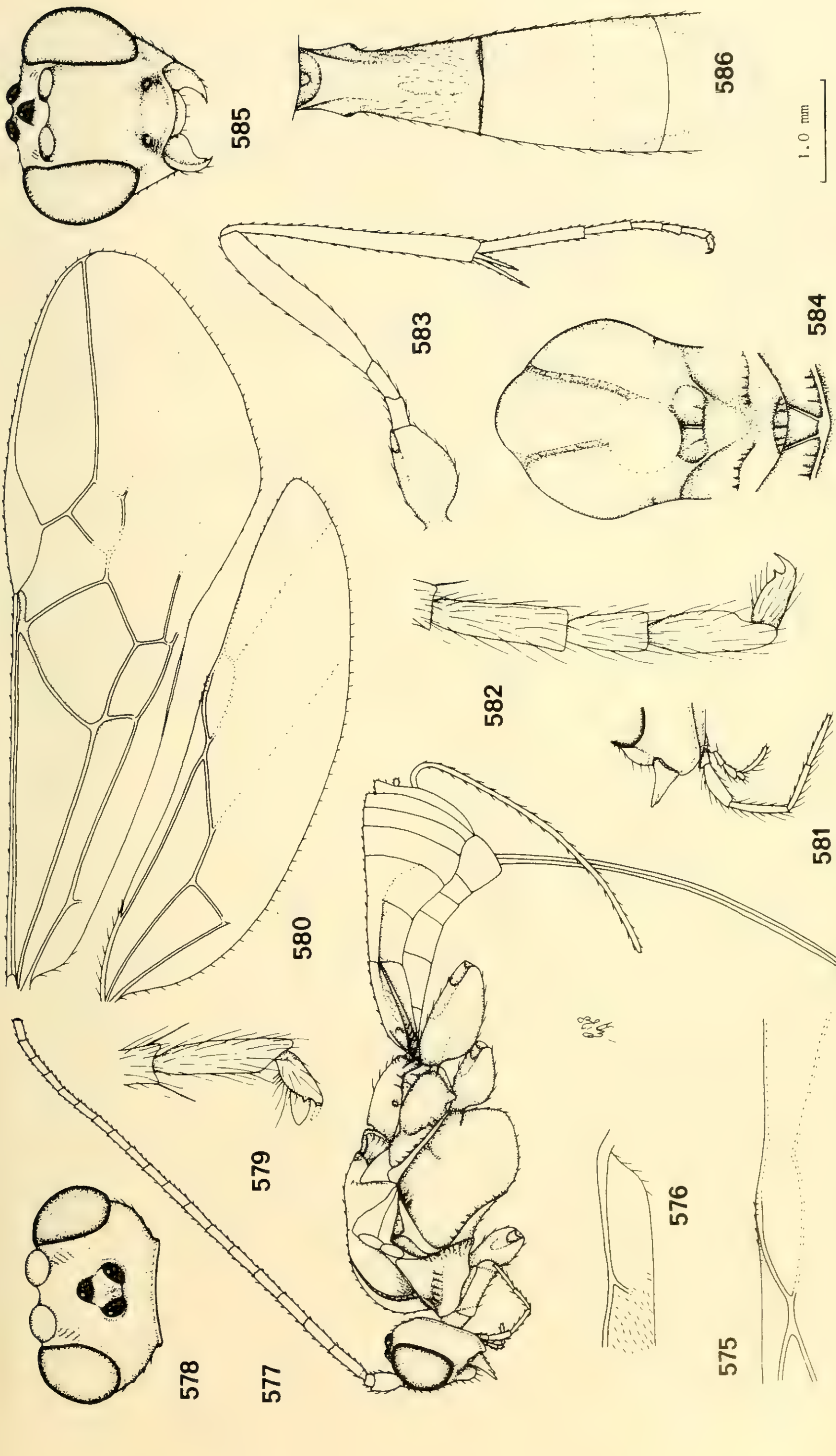
Figs. 540—552, *Homolobus (Oulophus) bicolor* spec. nov., holotype. 540, detail of veins SC + R1 and SR of hind wing; 541, habitus, lateral aspect; 542, detail of veins 1A + 2A and 2A of fore wing; 543, wings; 544, antenna; 545, outer hind claw; 546, palpi; 547, apex of antenna; 548, mesonotum, dorsal aspect; 549, head, frontal aspect; 550, head, dorsal aspect; 551, 1st—3rd tergites, dorsal aspect; 552, inner hind claw. 540, 542, 546, 548—551: 2.0 ×; 541, 543, 544: scale-line, 1 ×; 545, 547, 552: 5.0 ×



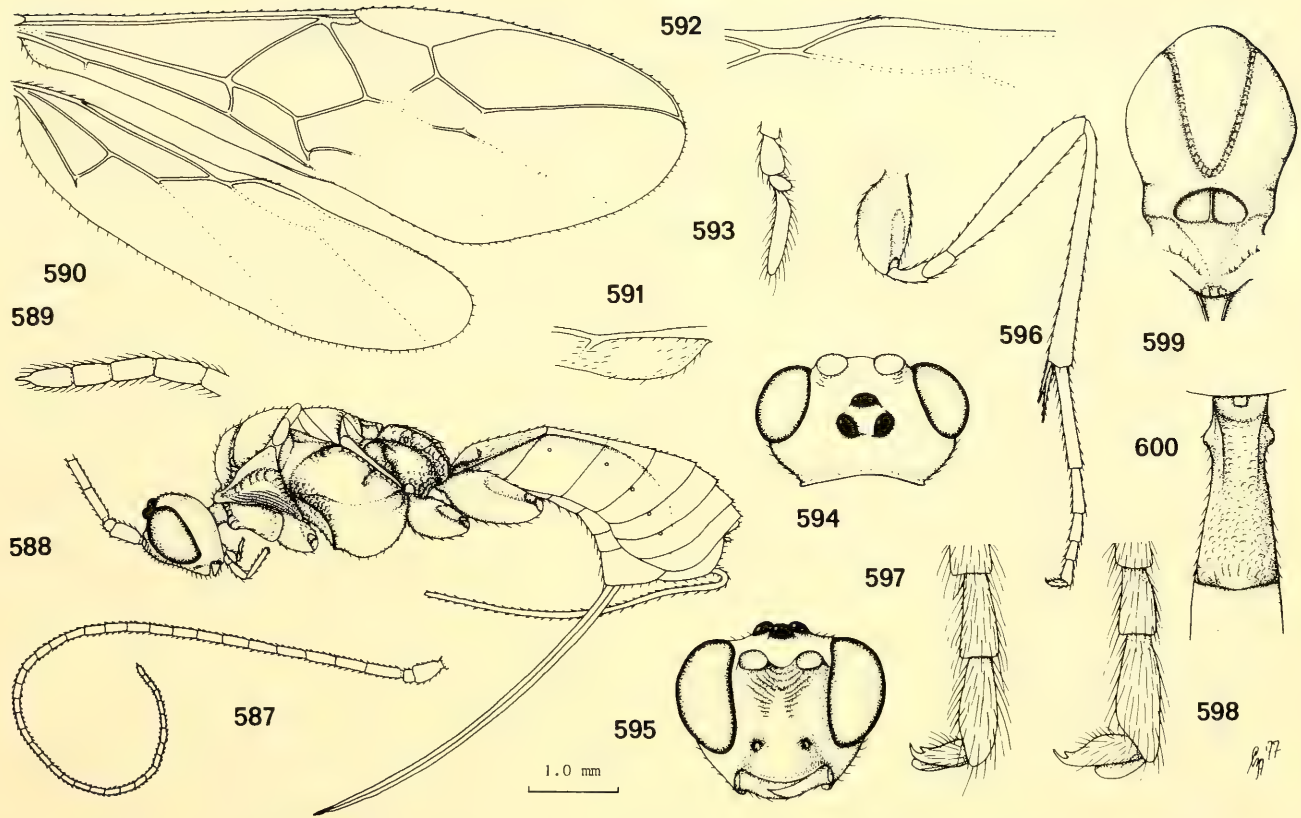
Figs. 553—563, *Homolobus (Oulophus) flagitator* (Curtis), ♀, Ireland, Drinnahilly, but 558—560 after ♀ from Hallifort. 553, habitus, lateral aspect; 554, head, frontal aspect; 555, wings; 556, head, dorsal aspect; 557, apex of antenna; 558, outer hind claw; 559, palpi; 560, inner hind claw; 561, antenna; 562, mesonotum, dorsal aspect; 563, 1st—3rd tergites, dorsal aspect. 553, 555, 561: scale-line, 1 ×; 554, 556, 559, 562, 563: 2.0 ×; 557, 558, 560: 5.0 ×



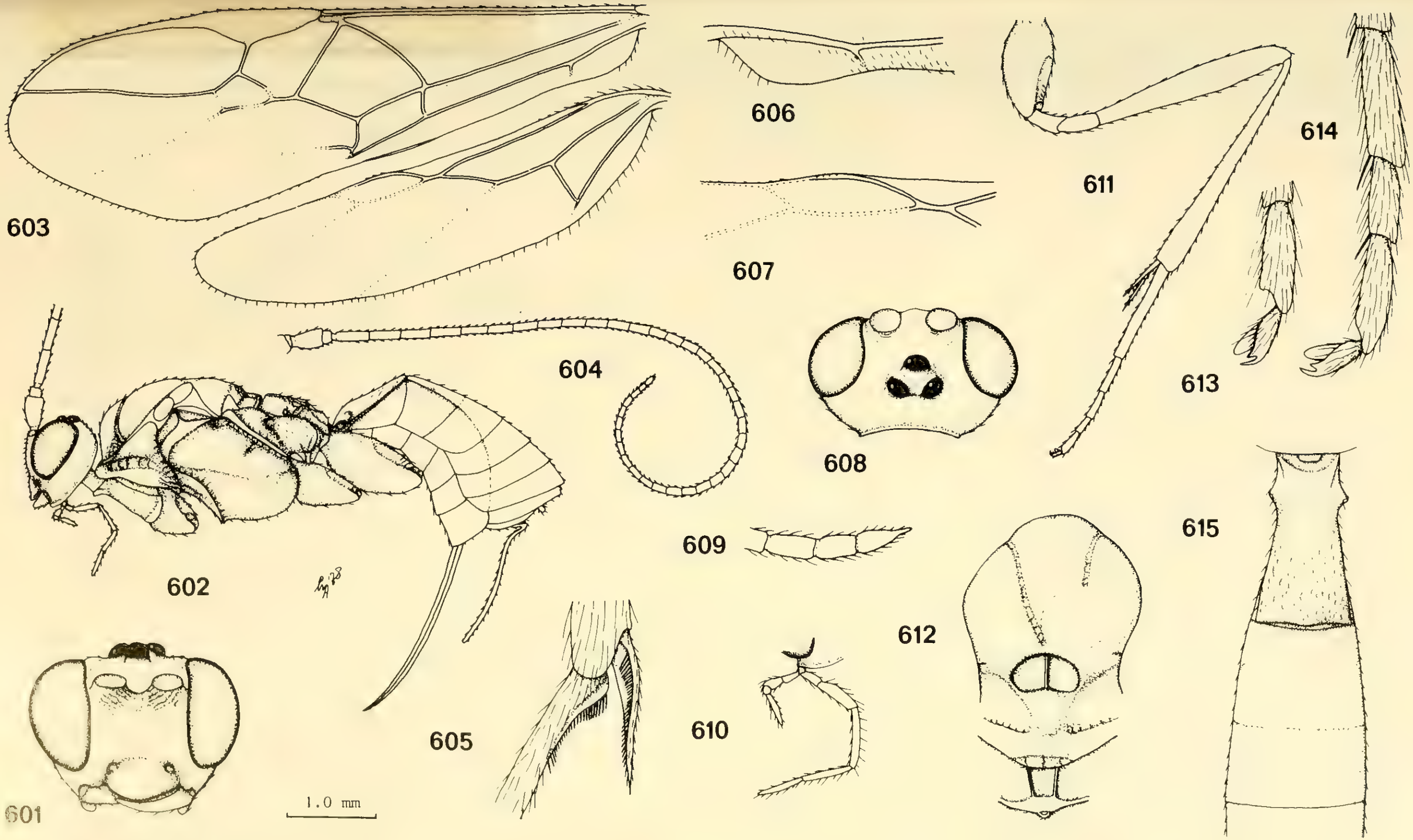
Figs. 564—574, *Homolobus (Oulophus) acares* spec. nov., holotype. 564, habitus, lateral aspect; 565, antenna; 566, detail of veins 1A + 2A and 2A of fore wing; 567, wings; 568, head, dorsal aspect; 569, detail of veins SC + R1 and SR of hind wing; 570, outer hind claw; 571, inner hind claw; 572, head, frontal aspect; 573, palpi; 574, apex of antenna. 564, 565, 567: scale-line, 1 ×; 566, 568, 569, 572, 573: 2.0 ×; 570, 571, 574: 5.0 ×



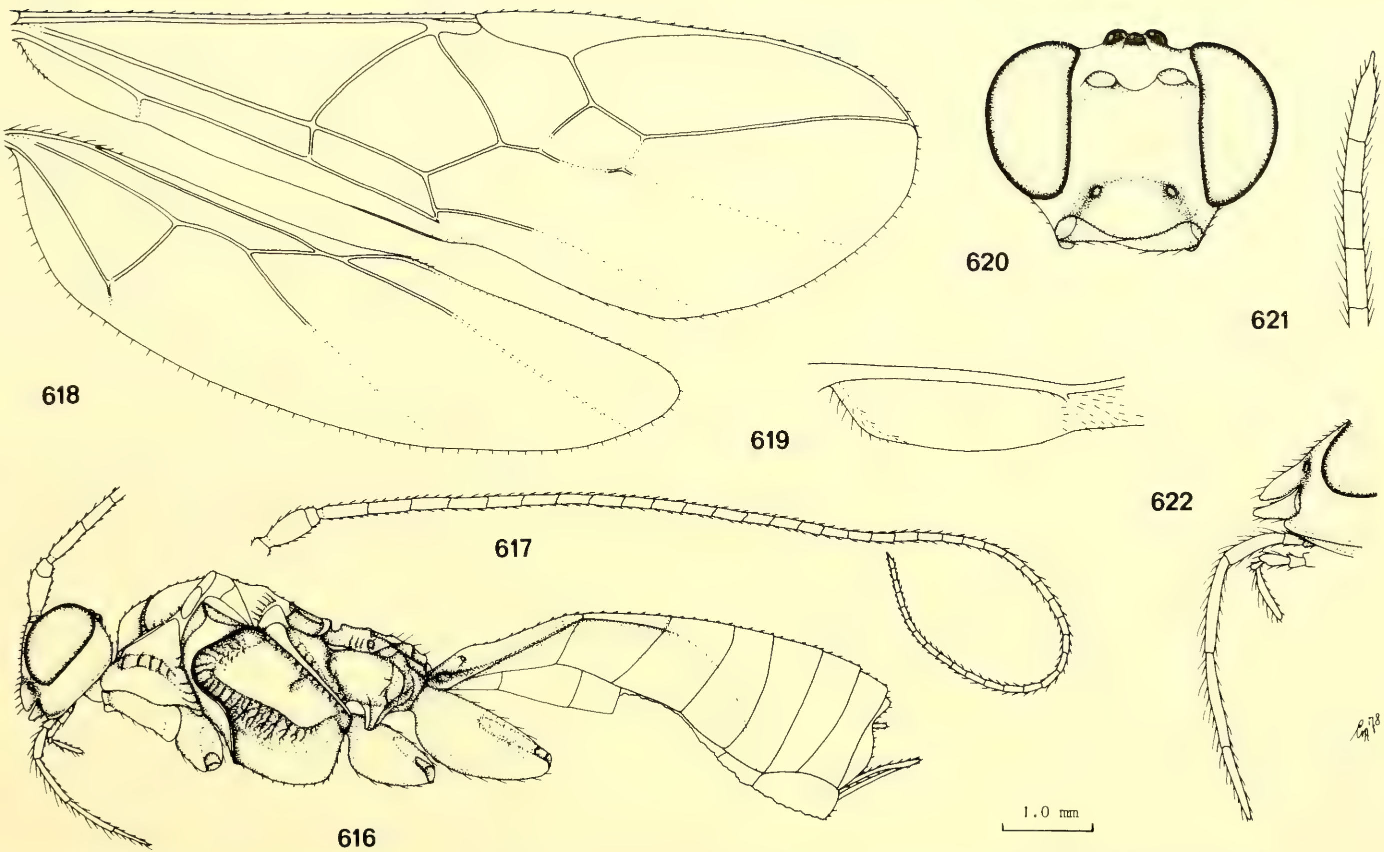
Figs. 575—586, *Homolobus (Oulophus) occidentalis* spec. nov., holotype. 575, detail of veins SC + R1 and SR of hind wing; 576, detail of veins 1A + 2A and 2A of fore wing; 577, habitus, lateral aspect; 578, head, dorsal aspect; 579, outer hind claw; 580 wings; 581, palpi; 582, inner hind claw; 583, hind leg; 584, mesonotum, dorsal aspect; 585, head, frontal aspect; 586, 1st-3rd tergites, dorsal aspect. 575, 576, 578, 581, 584—586: 2.0 ×; 577, 580, 583: scale-line, 1 ×; 579, 582: 5.0 ×



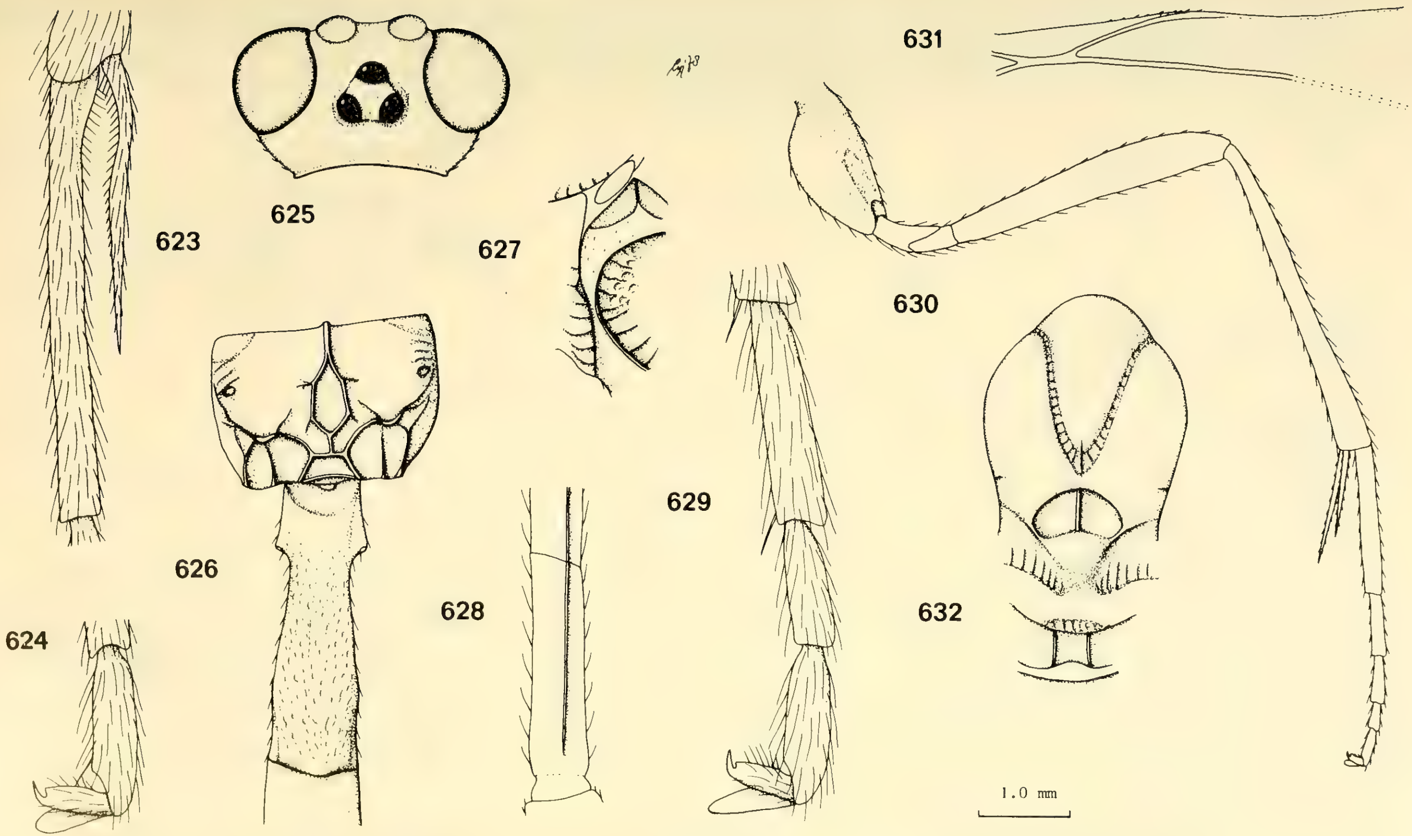
Figs. 587—600, *Homolobus (Oulophus) nipponensis* spec. nov., holotype. 587, antenna; 588, habitus, lateral aspect; 589, apex of antenna; 590, wings; 591, detail of veins 1A + 2A and 2A of fore wing; 592, detail of veins SC + R1 and SR of hind wing; 593, labial palp; 594, head, dorsal aspect; 595, head, frontal aspect; 596, hind leg; 597, outer hind claw; 598, inner hind claw; 599, mesonotum, dorsal aspect; 600, 1st tergite, dorsal aspect. 587, 588, 590, 596: scale-line, 1 ×; 589, 593, 597, 598: 5.0 ×; 591, 592, 594, 595, 599, 600: 2.0 ×



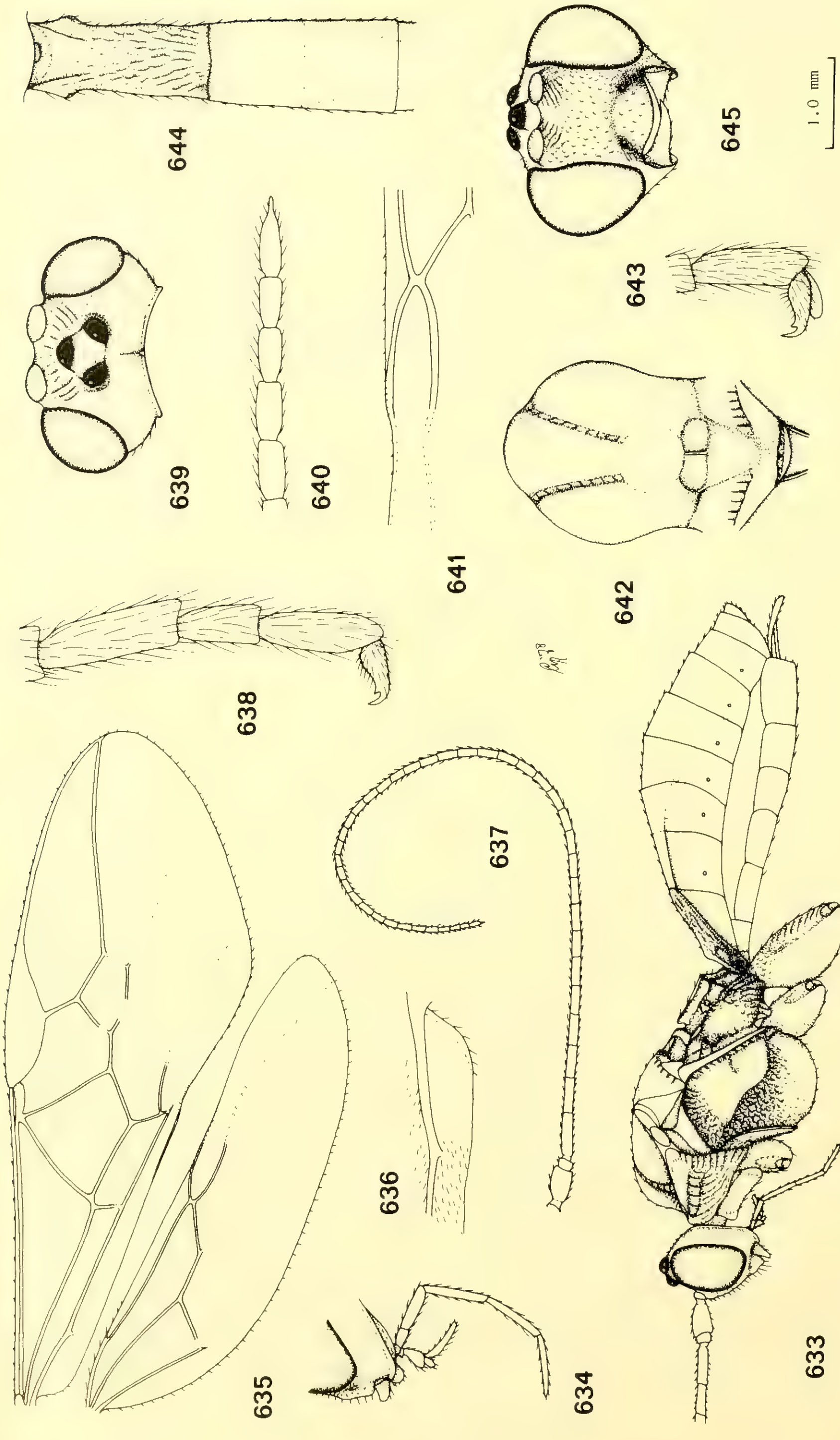
Figs. 601—615, *Homolobus (Oulophus) nepalensis* spec. nov., holotype. 601, head, frontal aspect; 602, habitus, lateral aspect; 603, wings; 604, antenna; 605, fore tibial spur, inner aspect; 606, detail of veins 1A + 2A and 2A of fore wing; 607, detail of veins SC + R1 and SR of hind wing; 608, head, dorsal aspect; 609, apex of antenna; 610, palpi; 611, hind leg; 612, mesonotum, dorsal aspect; 613, outer hind claw; 614, inner hind claw; 615, 1st—3rd tergites, dorsal aspect. 601, 606—608, 610, 612, 615: 2.0 ×; 602—604, 611: scale-line, 1 ×; 605, 609, 613, 614: 5.0 ×



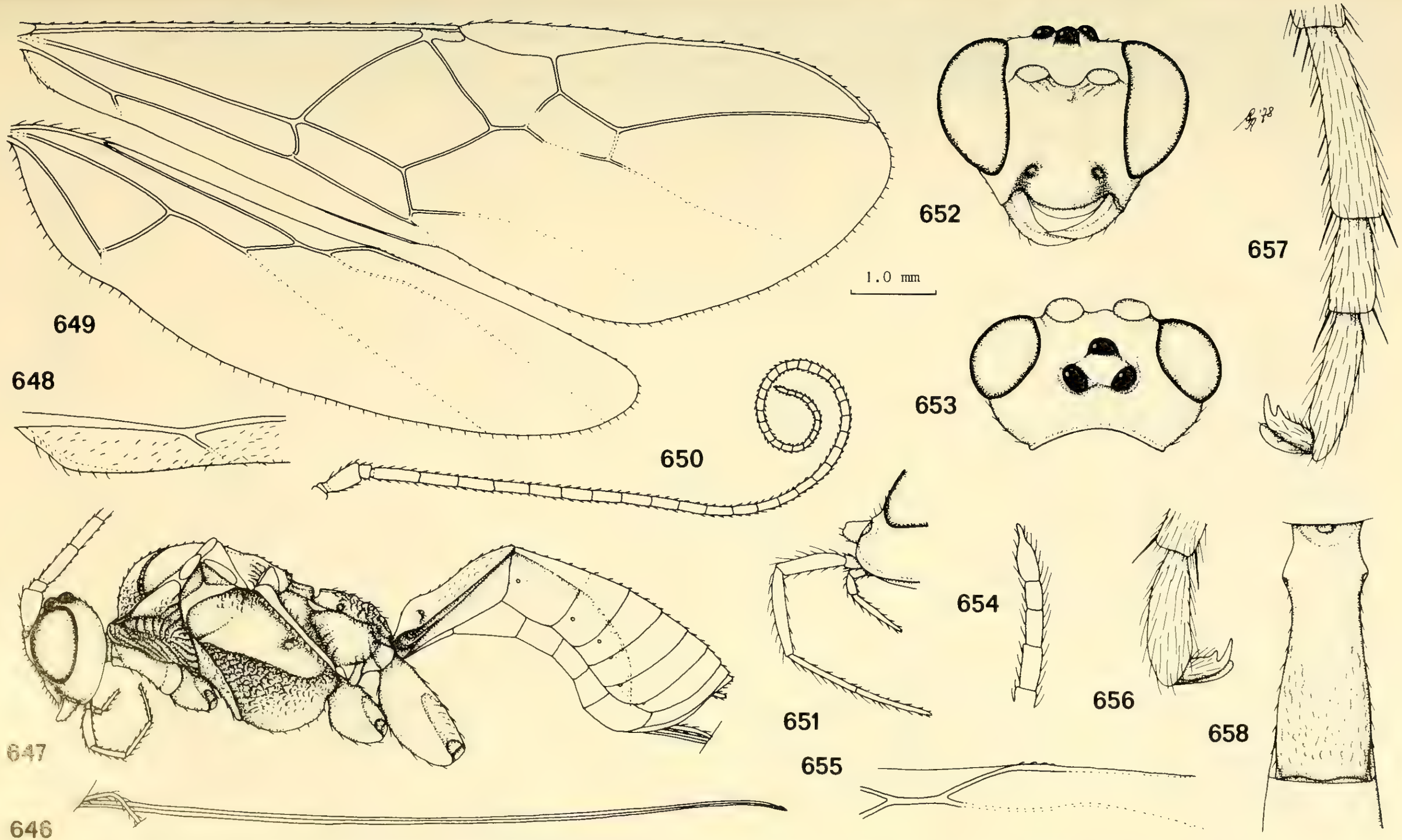
Figs. 616—622, *Homolobus (Oulophus) crenulatus* spec. nov. holotype. 616, habitus, lateral aspect; 617, antenna; 618, wings; 619, detail of veins 1A + 2A and 2A of fore wing; 620, head, frontal aspect; 621, apex of antenna; 622, palpi. 616—618: scale-line, 1 ×; 619, 620, 622: 2.0 ×; 621: 5.0 ×



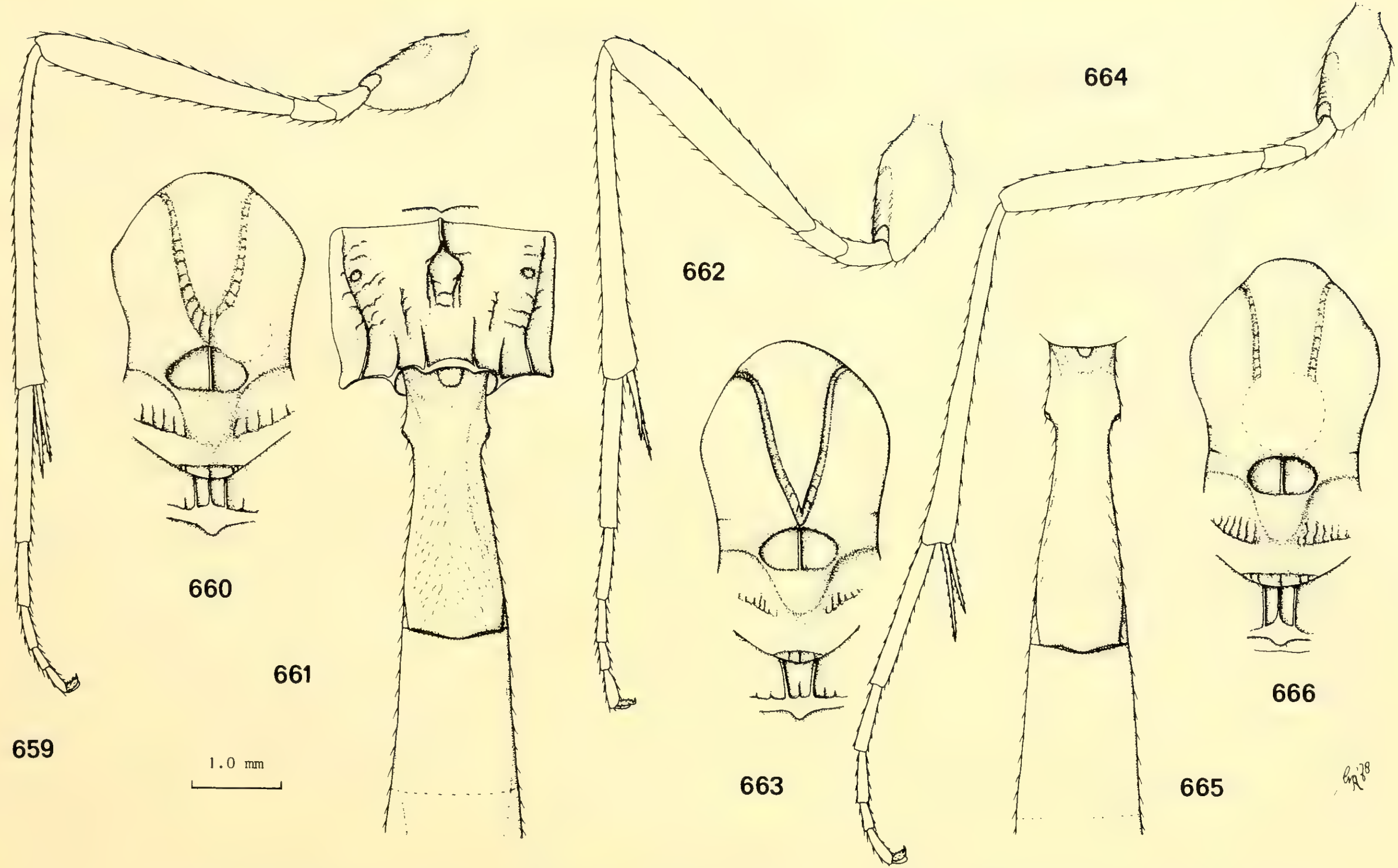
Figs. 623—632, *Homolobus (Oulophus) crenulatus* spec. nov., holotype. 623, fore tibial spurs, inner aspect; 624, outer hind claw; 625, head, dorsal aspect; 626, propodeum and 1st tergite, dorsal aspect; 627, detail of anterior part of mesopleuron; 628, 3rd antennal segment, inner aspect; 629, inner hind claw; 630, hind leg; 631, detail of veins SC + R1 and SR of hind wing; 632, mesonotum, dorsal aspect. 623, 624, 628, 629: 5.0 ×; 625, 627, 631, 632: 2.0 ×; 630: scale-line 1 ×



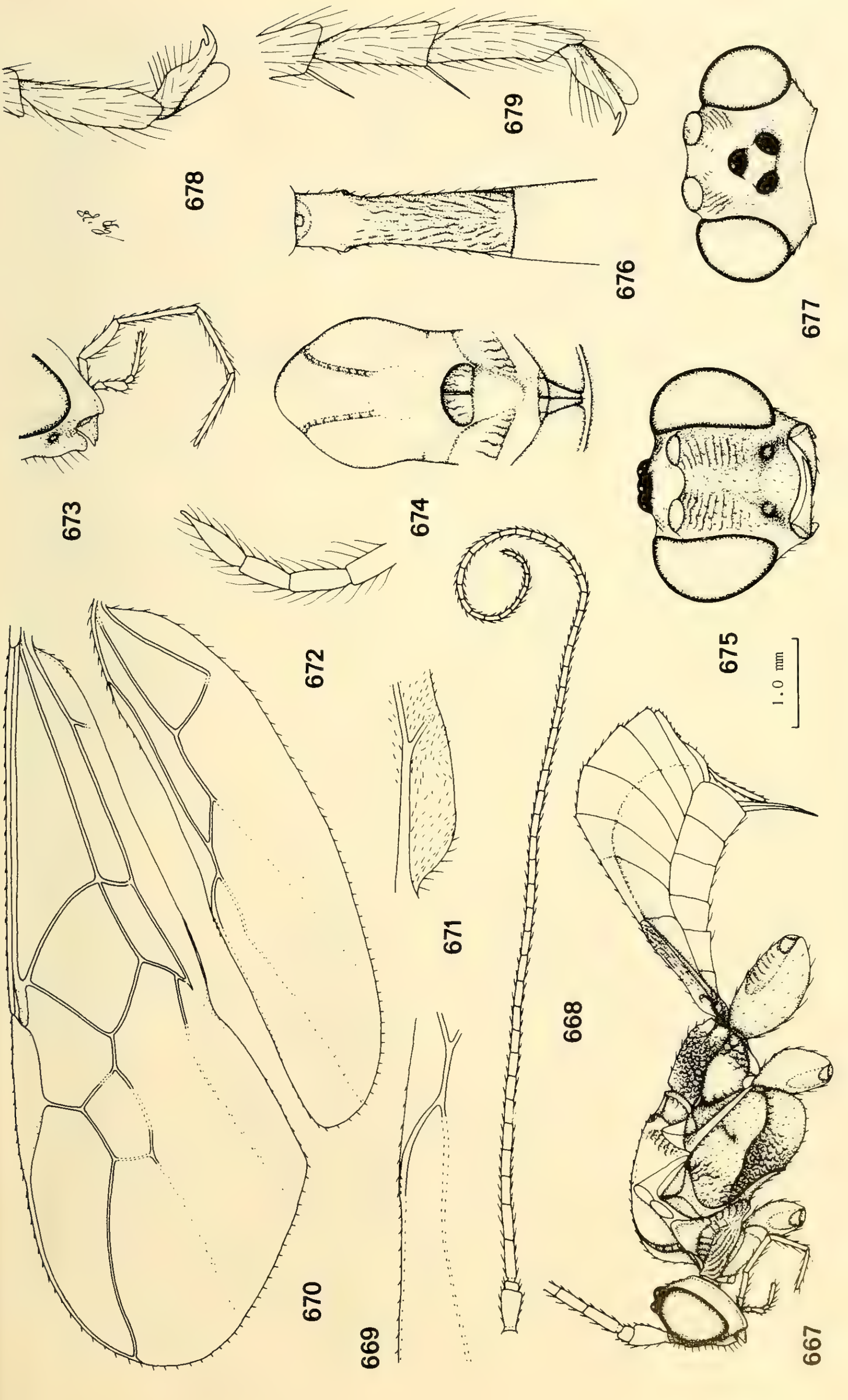
Figs. 633—645, *Homolobus (Oulophus) annulatus* spec. nov., holotype. 633, habitus, lateral aspect; 634, palpi; 635, wings; 636, detail of veins 1A + 2A and 2A of fore wing; 637, antenna; 638, inner hind claw; 639, head, dorsal aspect; 640, apex of antenna; 641, detail of veins SC + R1 and SR of hind wing; 642, mesonotum, dorsal aspect; 643, outer hind claw; 644, 1st—3rd tergites, dorsal aspect; 645, head, frontal aspect. 633, 635, 637: scale-line, 1 ×; 634, 636, 639, 641, 642, 644, 645: 2.0 ×; 638, 640, 643: 5.0 ×



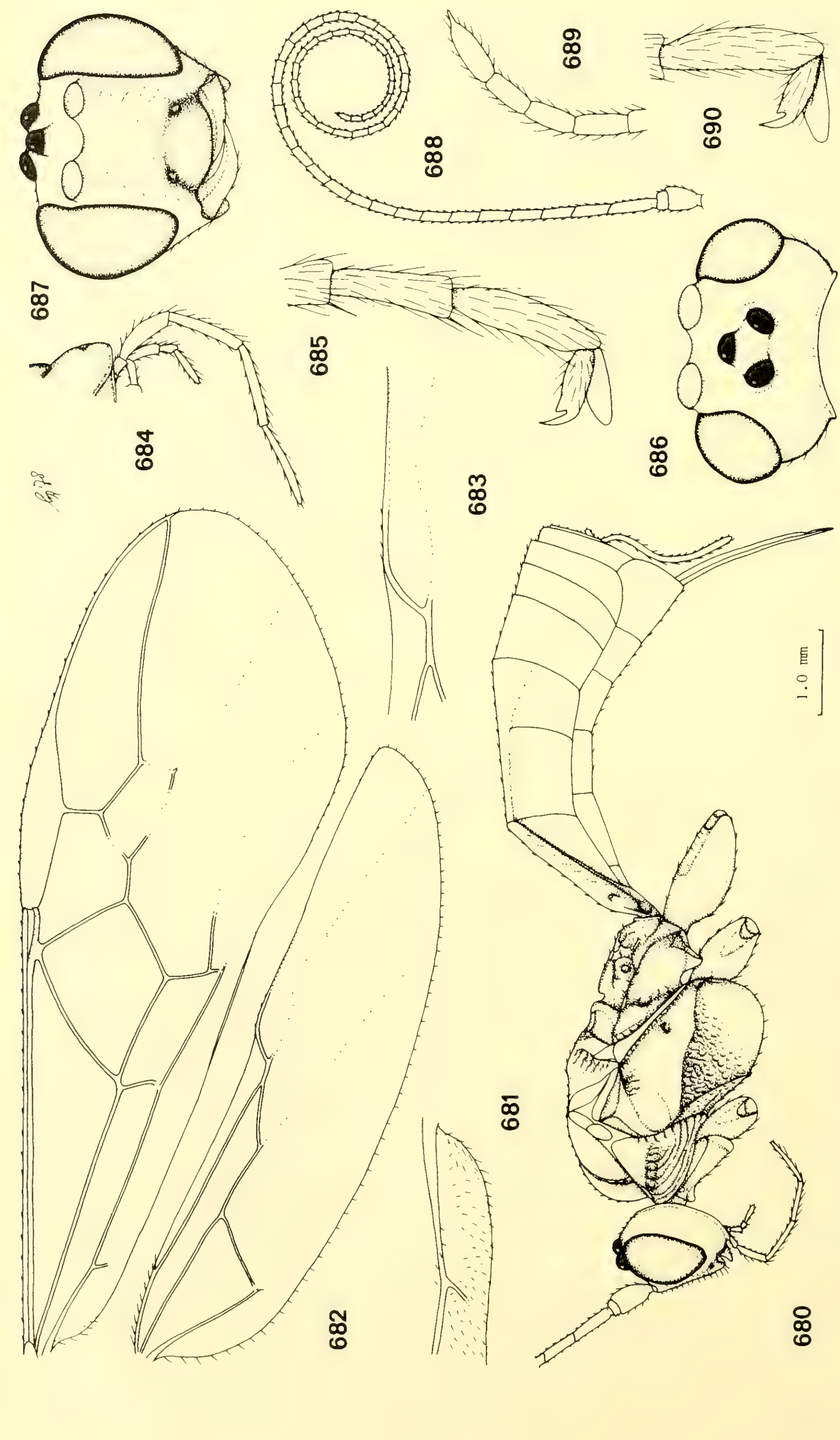
Figs. 646—658, *Homolobus (Oulophus) armatus* spec. nov., holotype. 646, ovipositor; 647, habitus, lateral aspect; 648, detail of veins 1A + 2A and 2A of fore wing; 649, wings; 650, antenna; 651, palpi; 652, head, frontal aspect; 653, head, dorsal aspect; 654, apex of antenna; 655, detail of SC + R1 and SR of hind wing; 656, outer hind claw; 657, inner hind claw; 658, 1st tergite, dorsal aspect. 646, 647, 649, 650: scale-line, 1 ×; 648, 651—653, 655, 658: 2.0 ×; 654, 656, 657: 5.0 ×



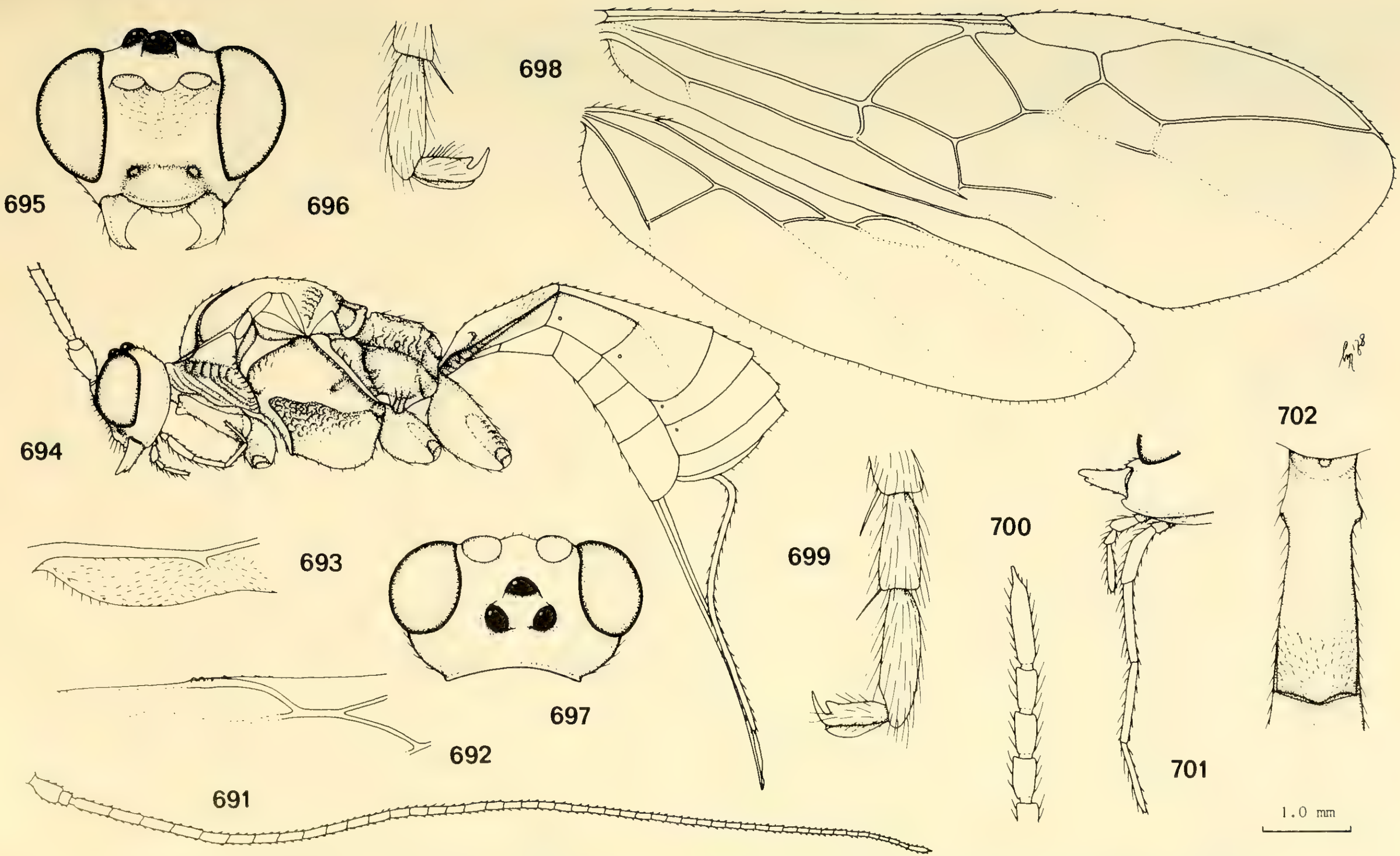
Figs. 659, 660, *Homolobus (Oulophus) armatus* spec. nov., holotype. 659, hind leg; 660, mesonotum, dorsal aspect. Figs. 661—663, *Homolobus (Oulophus) acares* spec. nov., holotype. 661, propodeum, 1st and 2nd tergites, dorsal aspect; 662, hind leg; 663, mesonotum, dorsal aspect. Figs. 664—666, *Homolobus (Oulophus) antefurcalis* spec. nov., holotype. 664, hind leg; 665, 1st and 2nd tergites, dorsal aspect; 666, mesonotum, dorsal aspect. 659, 662, 664: scale-line, 1 ×; 660, 661, 663, 665, 666: 2.0 ×



Figs. 667—679, *Homolobus (Oulophus) obscurus* spec. nov., holotype. 667, habitus, lateral aspect; 668, antenna; 669, detail of veins SC + R1 and SR of hind wing; 670, wings; 671, detail of veins 1A + 2A and 2A of fore wing; 672, apex of antenna; 673, palpi; 674, mesonotum, dorsal aspect; 675, head, frontal aspect; 676, 1st tergite, dorsal aspect; 677, head, dorsal aspect; 678, outer hind claw; 679, inner hind claw. 667, 668, 670: scale-line, 1 ×; 669, 671, 673—677: 2.0 ×; 672, 678, 679: 5.0 ×



Figs. 680—690. *Homolobus (Oulophus) antefurcalis* spec. nov., holotype. 680, habitus, lateral aspect; 681, detail of veins 1A + 2A and 2A of fore wing; 682, wings; 683, detail of veins SC + R1 and SR of hind wing; 684, palpi; 685, inner hind claw; 686, head, dorsal aspect; 687, head, frontal aspect; 688, antenna; 689, apex of antenna; 690, outer hind claw. 680, 682, 688: scale-line, 1 ×; 681, 683, 684, 686, 687: 2.0 ×; 685, 689, 690: 5.0 ×



Figs. 691—702, *Homolobus (Oulophus) mesoxiphius* spec. nov., holotype. 691, antenna; 692, detail of veins SC + R1 and SR of hind wings; 693, detail of veins 1A + 2A and 2A of hind wing; 694, habitus, lateral aspect; 695, head, frontal aspect; 696, outer hind claw; 697, head, dorsal aspect; 698, wings; 699, inner hind claw; 700, apex of antenna; 701, palpi; 702, 1st tergite, dorsal aspect. 691, 694, 698: scale-line, 1 ×; 692, 693, 695, 7697, 701, 702: 2.0 ×; 696, 699, 700: 5.0 ×

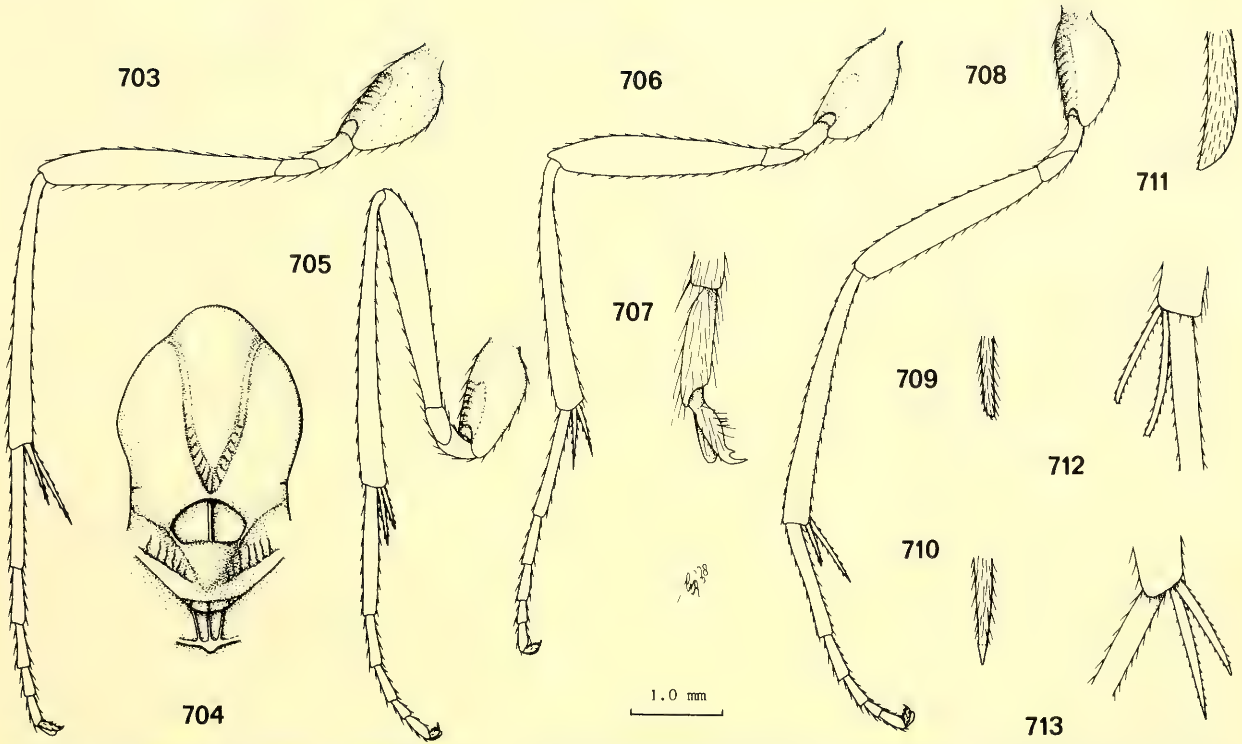
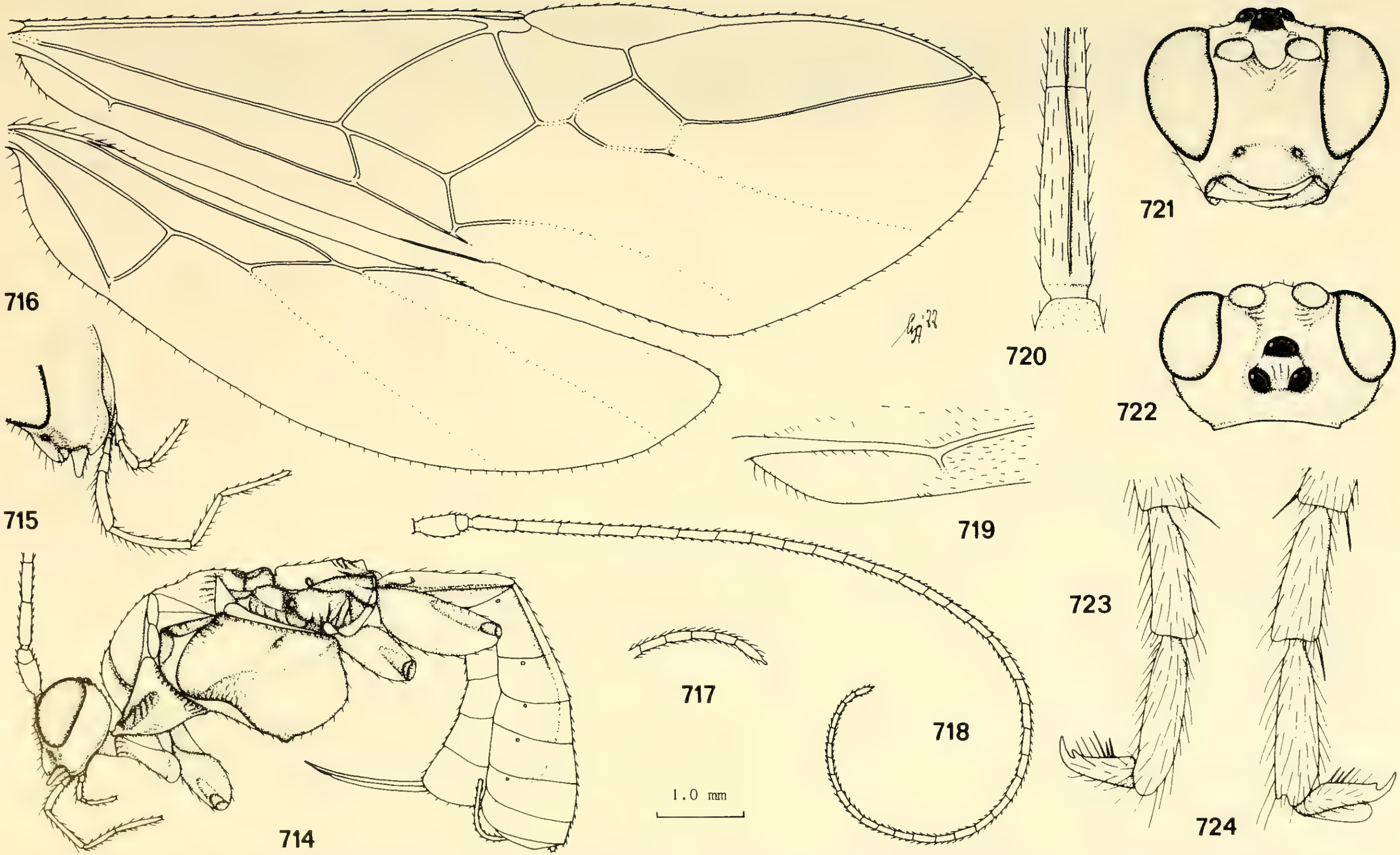
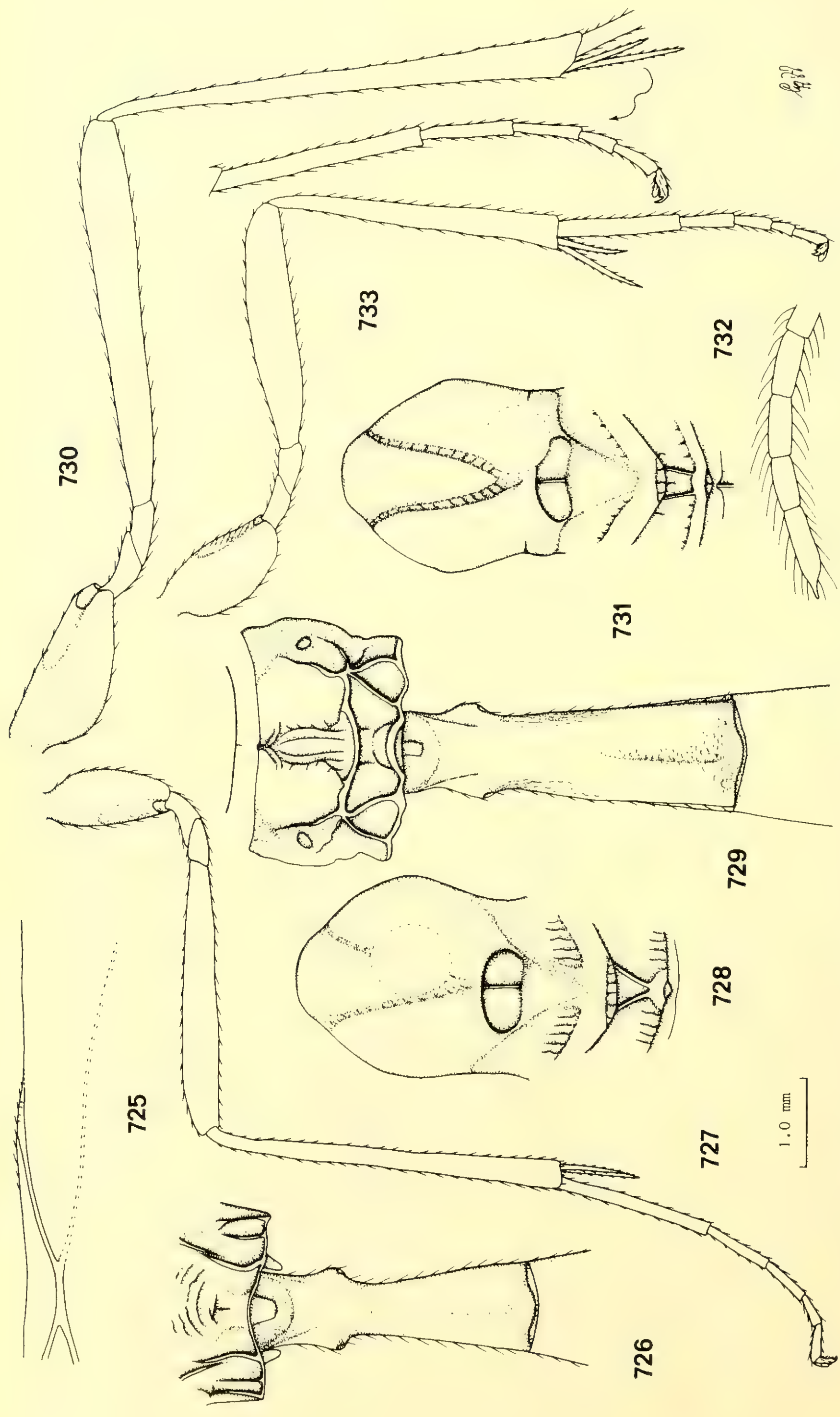


Fig. 703, *Homolobus (Oulophus) obscurus* spec. nov., holotype, hind leg. Figs. 704, 705, *Homolobus (Oulophus) mesoxiphius* spec. nov., holotype. 704, mesonotum, dorsal aspect; 705, hind leg. Fig. 706, *Homolobus (Oulophus) bicolor* spec. nov., holotype, hind leg. Fig. 707, *Homolobus (Oulophus) bohemani* (Bengtsson), ♀, India, Kumaon Hills, outer hind claw. Fig. 708, *Homolobus (Oulophus) annulatus* spec. nov., holotype, hind leg. Figs. 709, 712, *Homolobus (Apatia) pallidistigmus* (Cameron), ♂, Tanzania, Magamba. 709, detail of apex of outer hind spur; 712, hind tibial spurs, lateral aspect. Fig. 711, *Homolobus (Apatia) truncator* (Say), ♂, U.S.A., Michigan, Chrystal Falls, apex of outer hind spur, lateral aspect. Figs. 710, 713, *Homolobus (Apatia) priapus* (Nixon), ♂, S.Africa, Magoesbaskloof. 710, detail of apex of outer hind spur, lateral aspect; 713, hind tibial spurs, lateral aspect. 703, 705, 706, 708: scale-line, 1 ×; 704, 712, 713: 2.0 ×; 707, 709—711: 5.0 ×

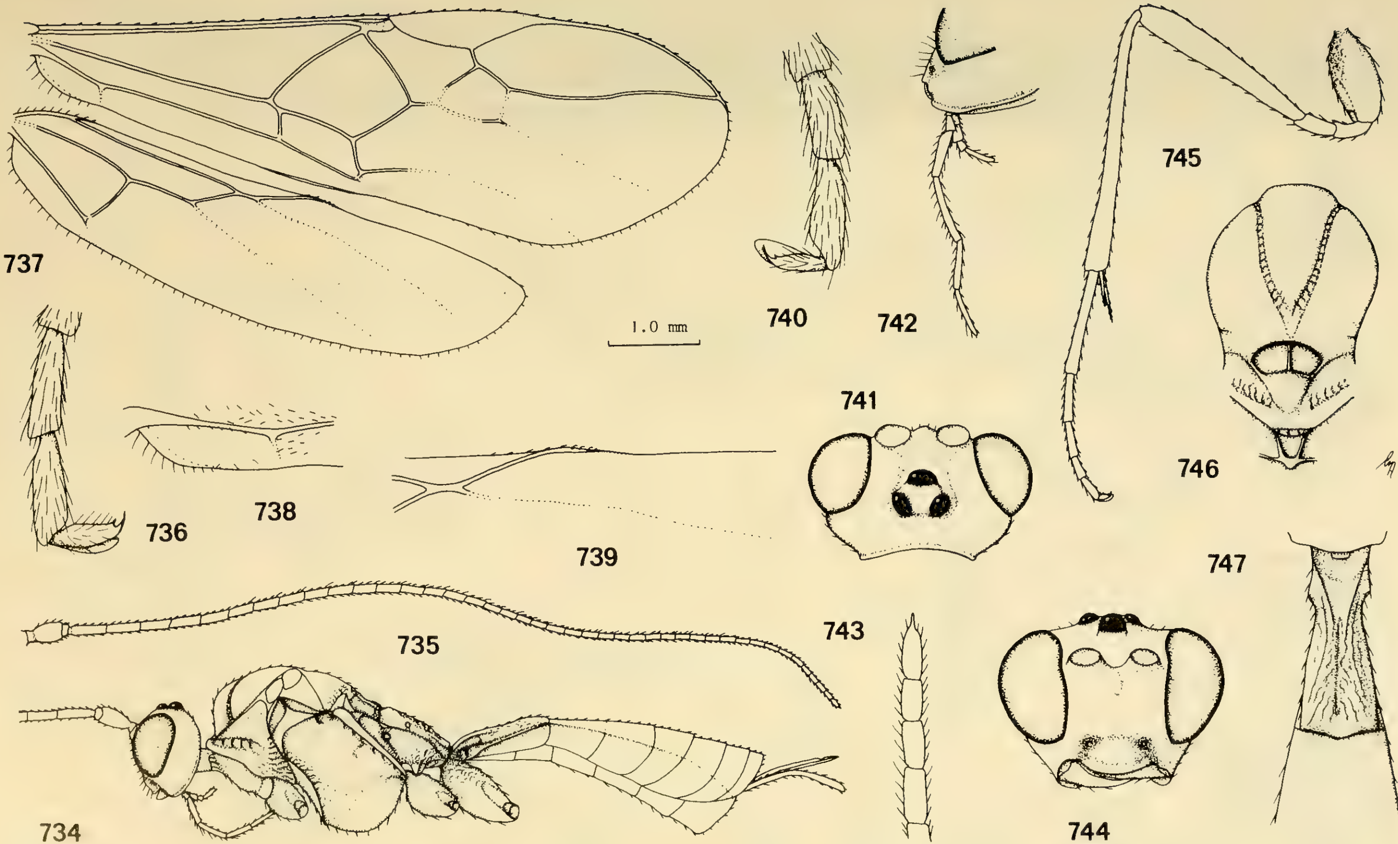


716 715 714 717 718 719 720 721 722 723 724

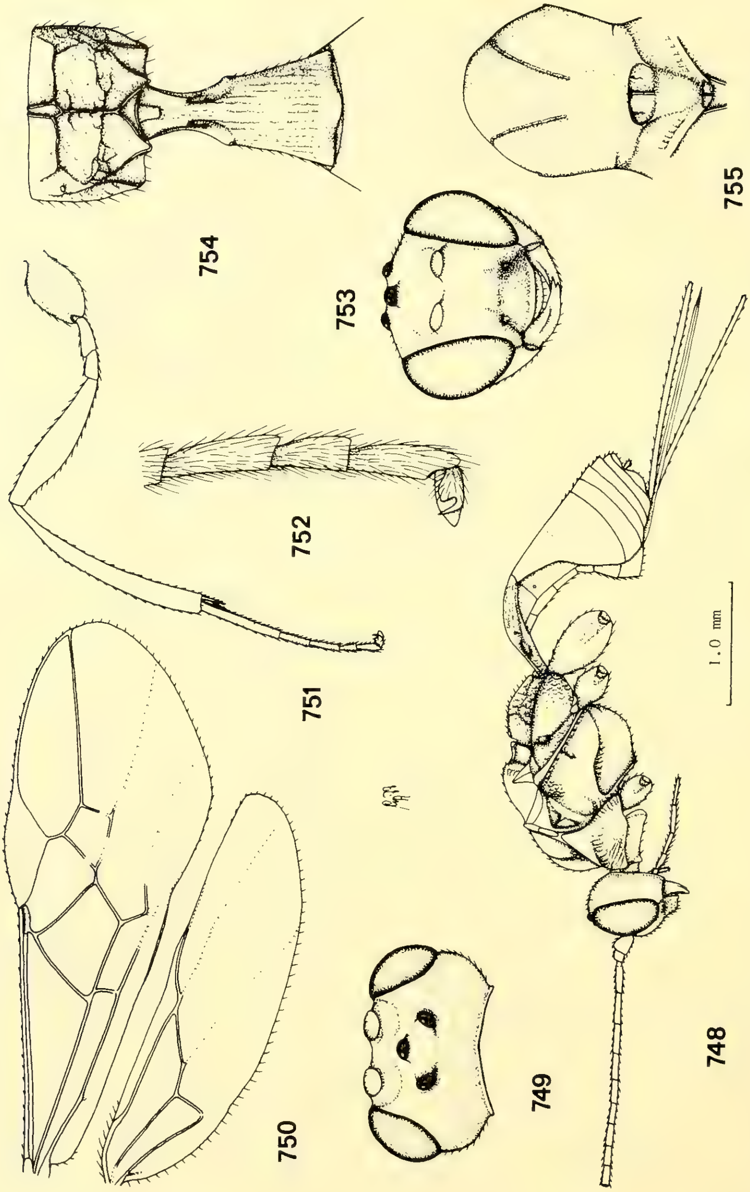
Figs. 714—724, *Homolobus (Oulophus) macropterus* spec. nov., holotype. 714, habitus, lateral aspect; 715, palpi; 716, wings; 717, apex of antenna; 718, antenna; 719, detail of veins 1A + 2A and 2A; 720, 3rd antennal segment, inner aspect; 721, head, frontal aspect; 722, head, dorsal aspect; 723, inner hind claw; 724, outer hind claw. 714, 716, 718: scale-line, 1 ×; 715, 717, 719, 721, 722: 2.0 ×; 720, 723, 724: 5.0 ×



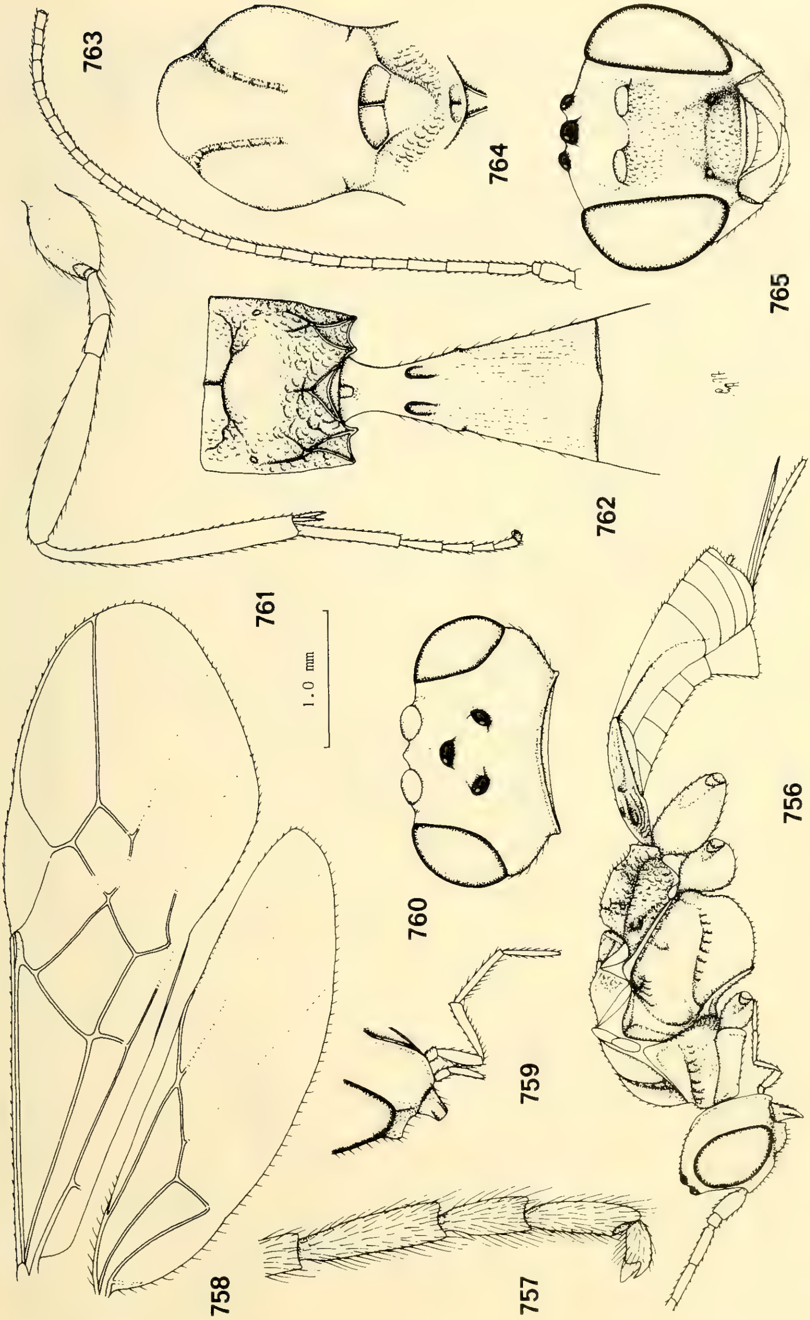
Figs. 725—728, *Homolobus (Oulophus) macropterus* spec. nov., holotype. 725, detail of veins SC + R1 and SR of hind wing; 726, apical half of propodeum and 1st tergite, dorsal aspect; 727, hind leg; 728, mesonotum, dorsal aspect. Fig. 729, 730, *Homolobus (Chartolobus) undulatus* spec. nov., holotype. 729, propodeum and 1st tergite, dorsal aspect; 730, hind leg. Fig. 731—733, *Exasticolus tuberculatus* spec. nov., holotype. 731, mesonotum, dorsal aspect; 732, apex of antenna; 733, hind leg. 725, 726, 728, 731: 2.0 ×; 727, 730, 733: scale-line, 1 ×; 729: 1.4 ×; 732: 5.0 ×



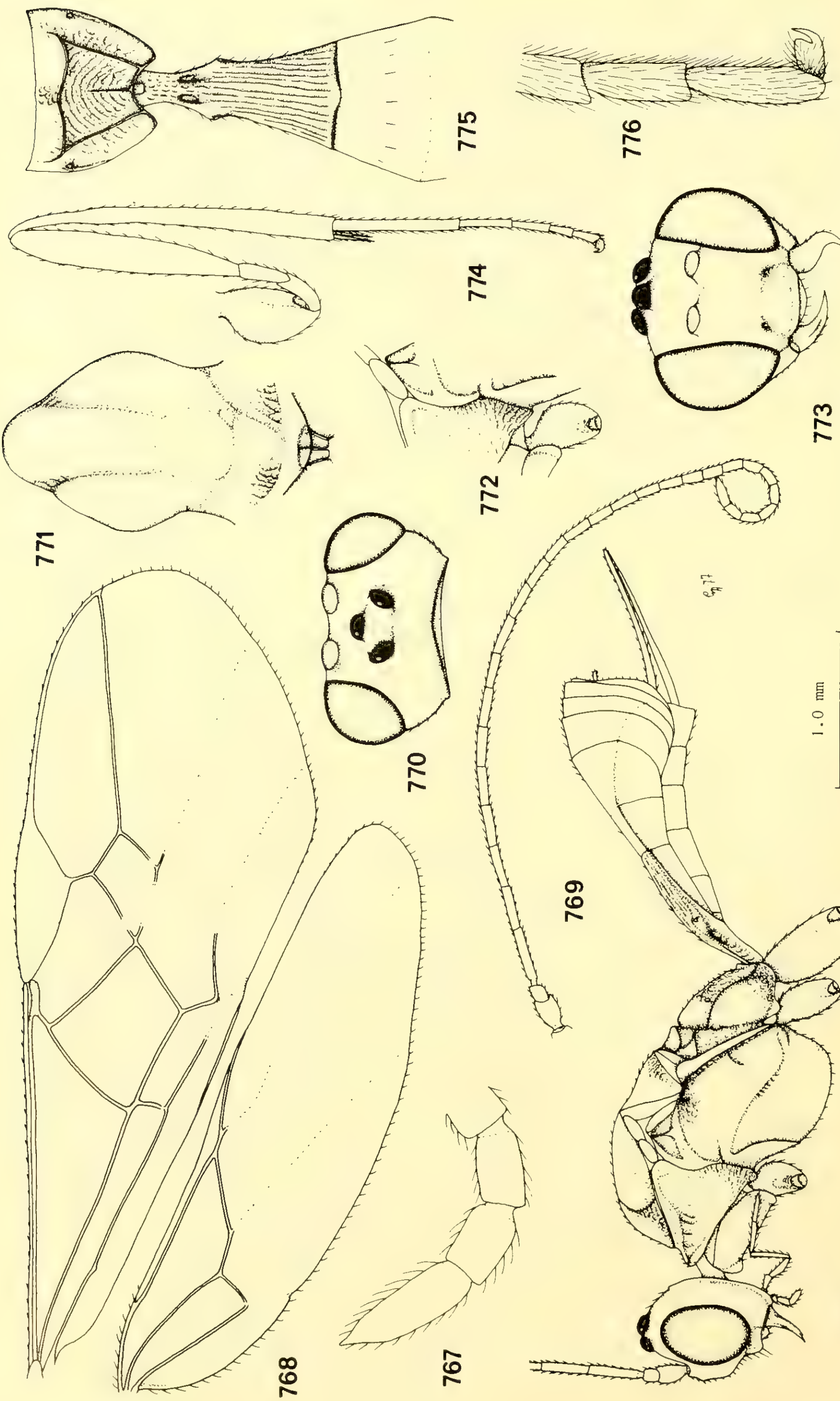
Figs. 734—747, *Homolobus (Oulophus) rectinervis* spec. nov., holotype. 734, habitus, lateral aspect; 735, antenna; 736, claw; 737, wings; 738, detail of veins 1A + 2A and 2A of fore wing; 739, detail of veins SC + R1 and SR of hind wing; 740, outer hind claw; 741, head, dorsal aspect; 742, palpi; 743, apex of antenna; 744, head, frontal aspect; 745, hind leg: 746, mesonotum, dorsal aspect; 747, 1st tergite, dorsal aspect. 734, 735, 737, 745: scale-line, 1 ×; 736, 740, 743: 5.0 ×; 738, 739, 741, 742, 744, 746, 747: 2.0 ×



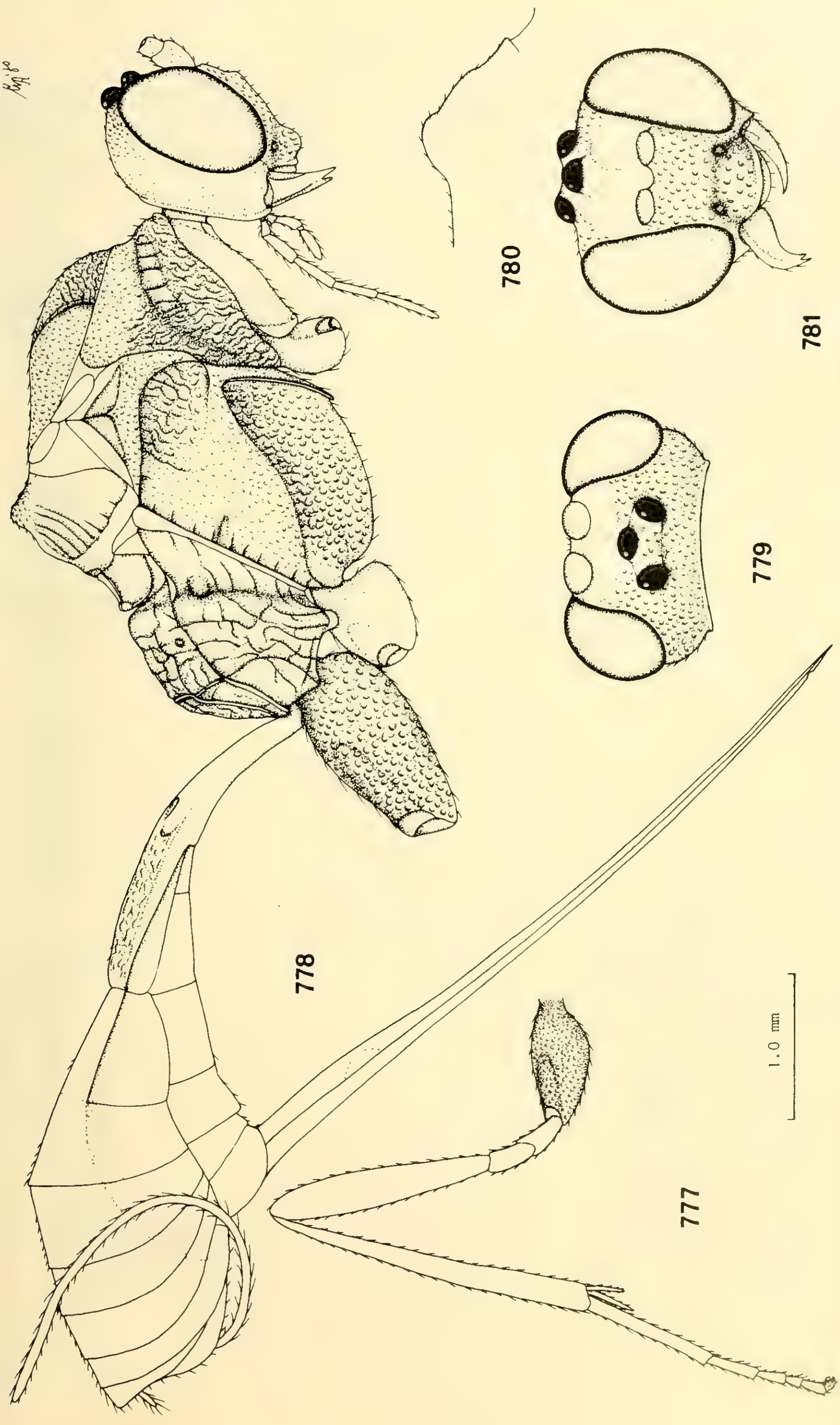
Figs. 748—755, *Zele annulicrus* (Thomson), lectotype. 748, habitus, lateral aspect; 749, head, dorsal aspect; 750, wings; 751, hind leg; 752, inner hind claw; 753, head, frontal aspect; 754, propodeum and 1st tergite; 755, mesonotum, dorsal aspect. 748, 750, 751: scale-line, 1 ×; 749, 753—755: 2.0 ×; 752: 5.0 ×



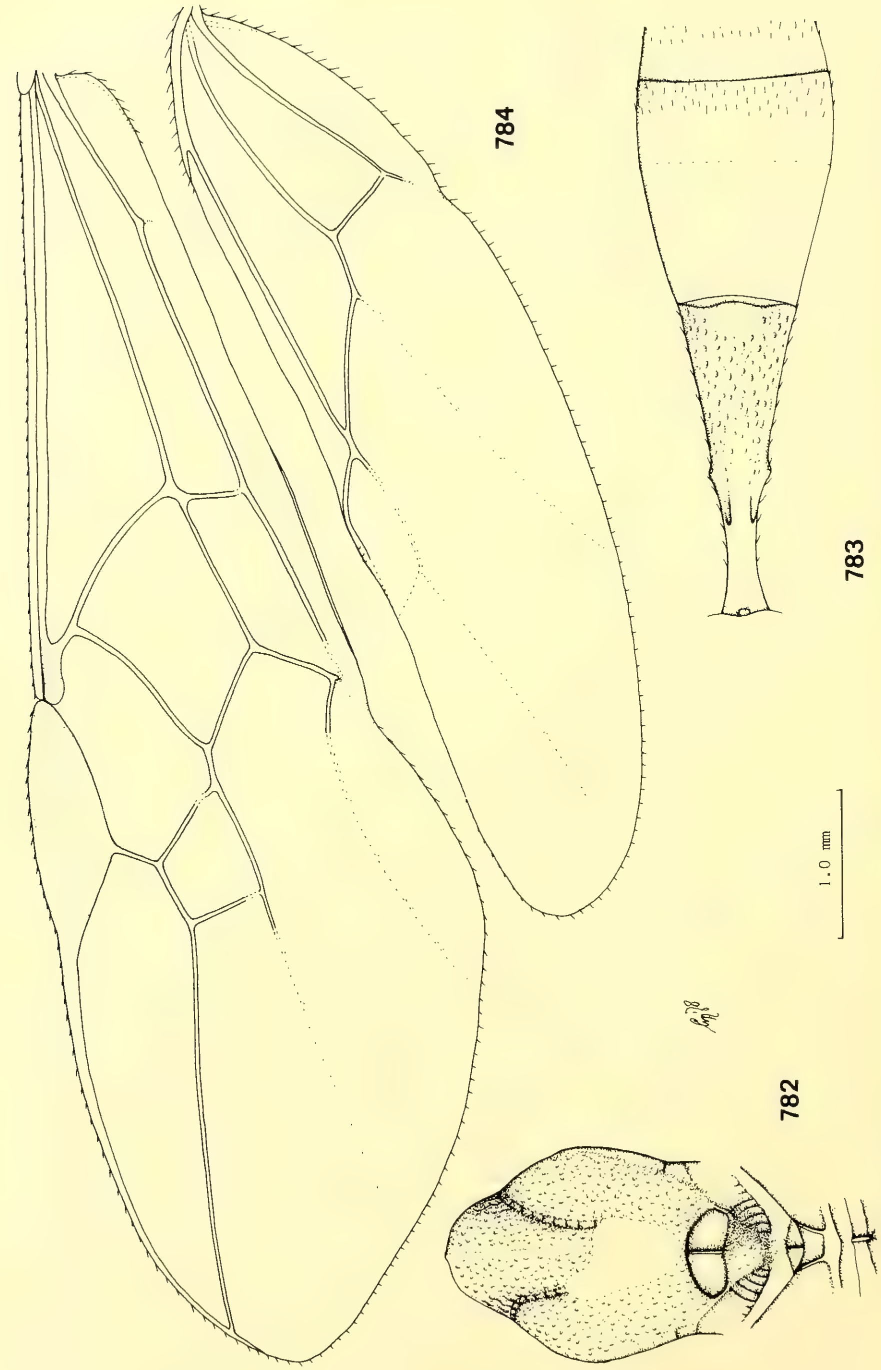
Figs. 756—765, *Zele neesii* (Ruthe), holotype. 756, habitus, lateral aspect; 757, outer hind claw; 758, wings; 759, palpi; 760, head, dorsal aspect; 761, hind leg; 762, propodeum and 1st tergite, dorsal aspect; 763, antenna; 764, mesonotum, dorsal aspect; 765, head, frontal aspect. 756, 758, 761, 763: scale-line, 1 ×; 757: 5.0 ×; 759, 760, 762, 764, 765: 2.0 ×



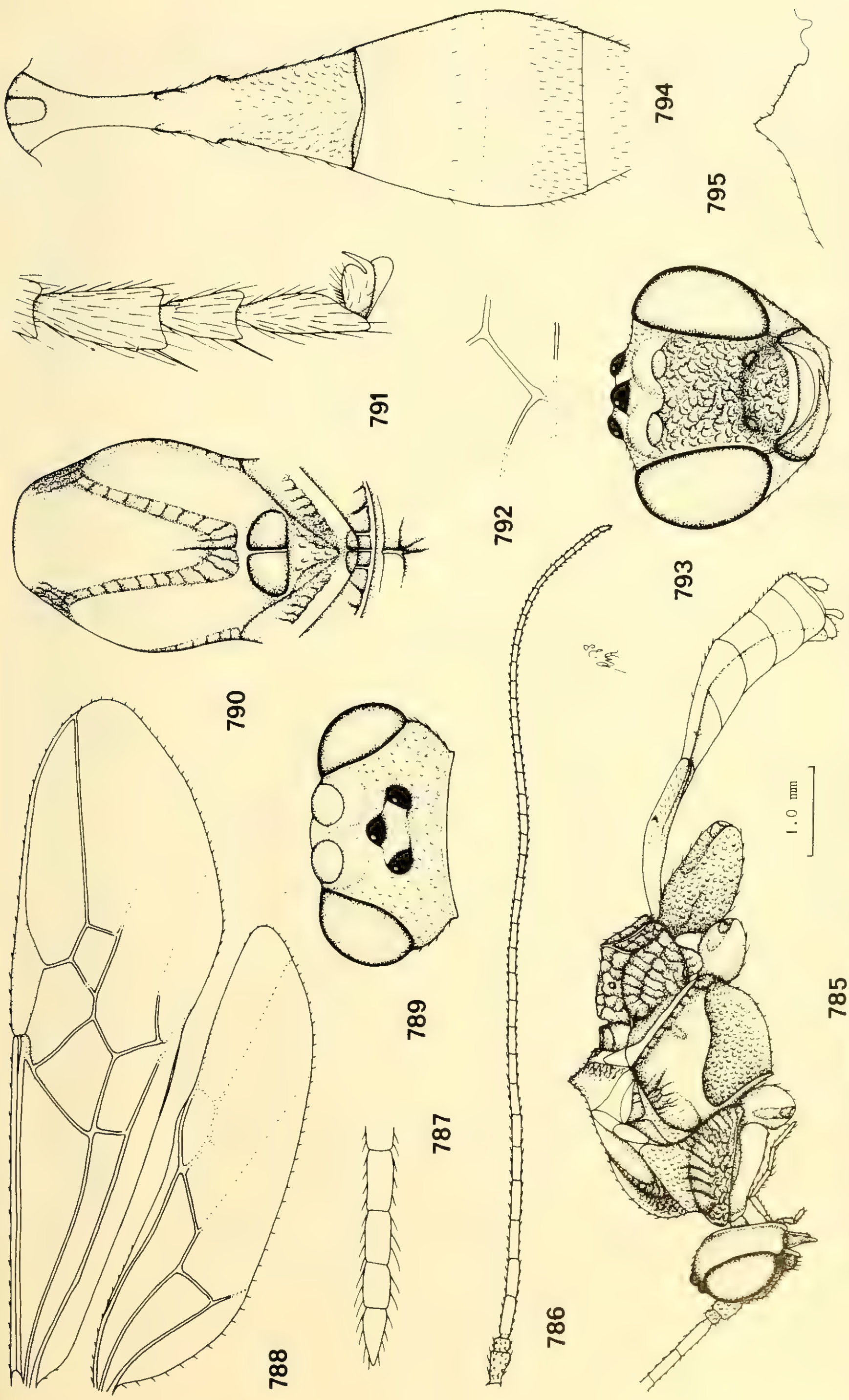
Figs. 766—776, *Zele levis* (Muesebeck), holotype. 766, habitus, lateral aspect; 767, apex of antenna; 768, wings; 769, antenna; 770, head, dorsal aspect; 771, mesonotum, dorsal aspect; 772, detail of anterior part of mesopleuron, lateral aspect; 773, head, frontal aspect; 774, hind leg; 775, propodeum, 1st and 2nd tergites, dorsal aspect; 776, inner hind claw. 766, 769, 774: scale-line, 1 ×; 767, 776: 5.0 ×; 770—773, 775: 1.4 ×



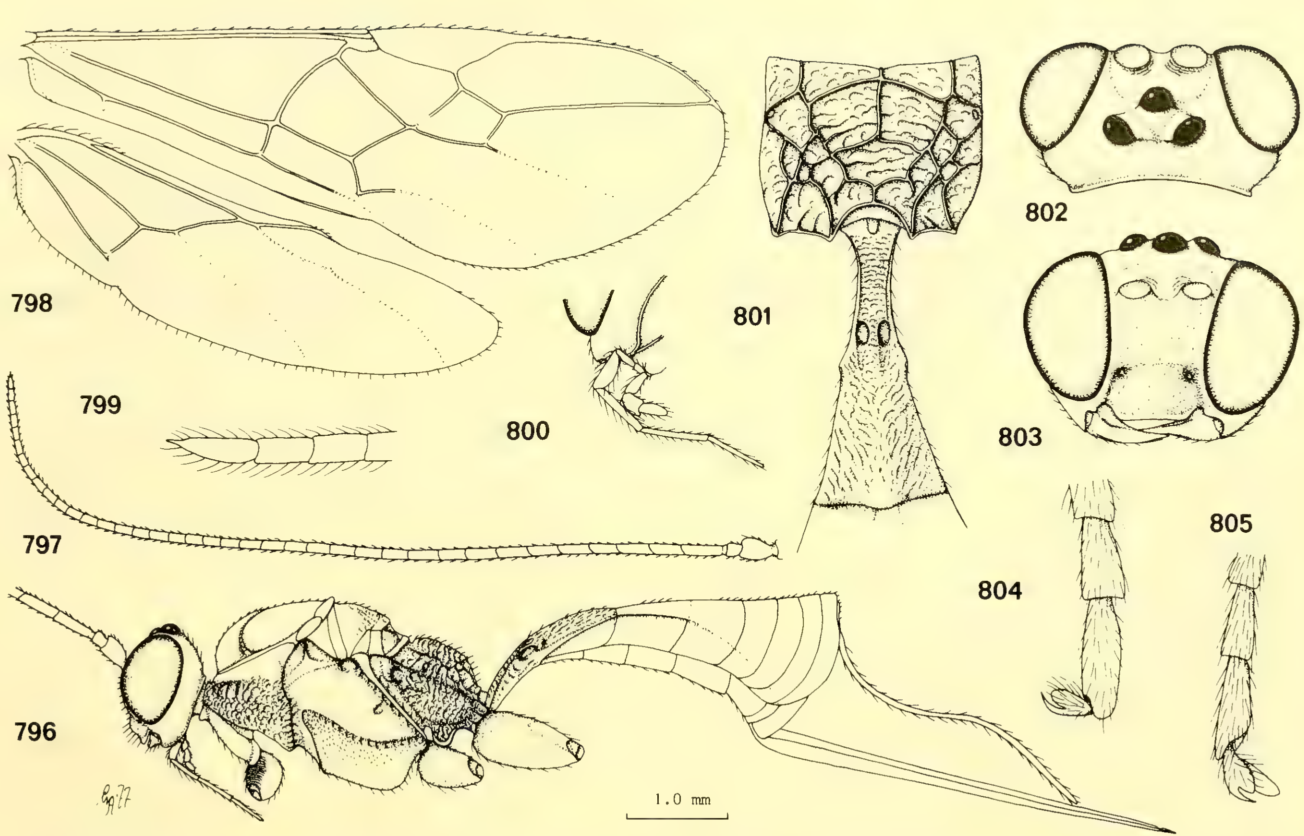
Figs. 777—781, *Zele punctatus* spec. nov., holotype, but 780 of allotype. 777, hind leg; 778, habitus, lateral aspect; 779, head, dorsal aspect; 780, detail of scutellum, lateral aspect; 781, head, frontal aspect. 777: 06 × ; 778: scale-line, 1 × ; 779, 781: 1.2 × ; 780: 2.0 ×



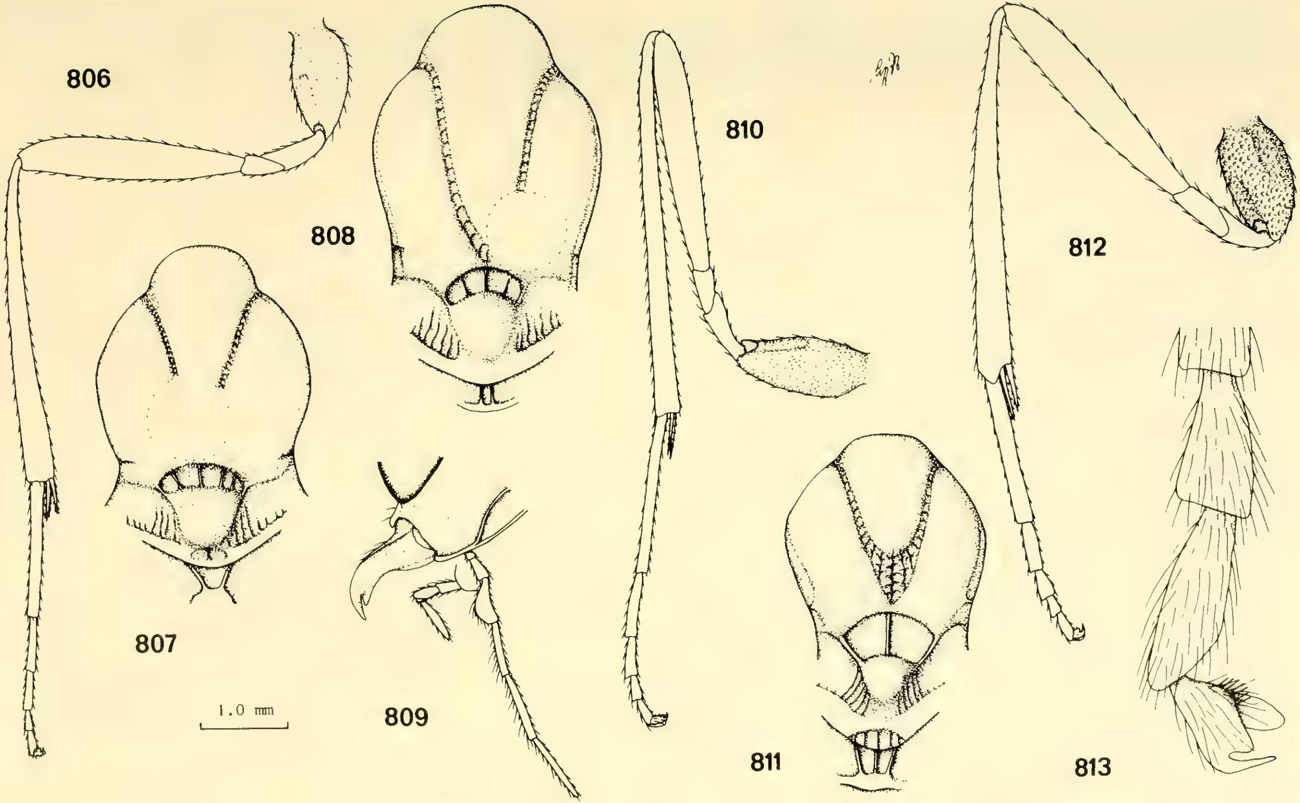
Figs. 782—784, *Zele punctatus* spec. nov. holotype. 782, mesonotum, dorsal aspect; 783, 1st—3rd tergites, dorsal aspect; 784, wings. 782, 783: 1.2 ×; 784: scale-line, 1 ×



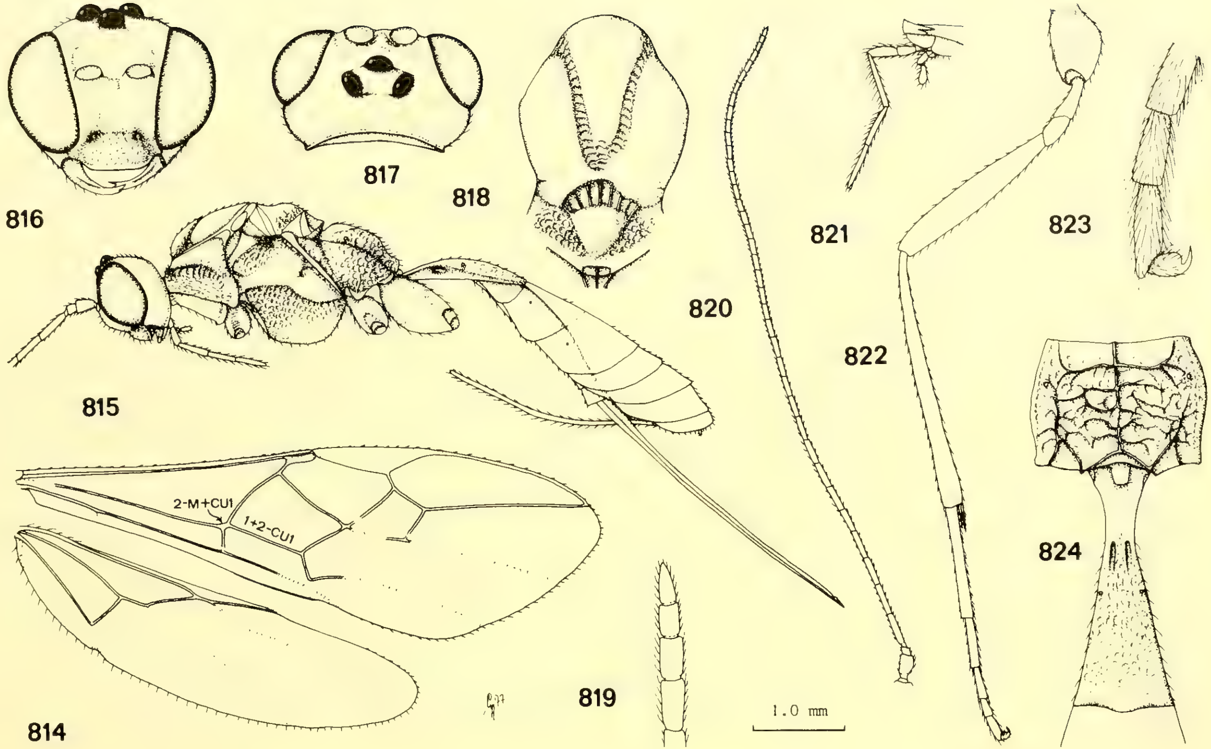
Figs. 785—795, *Zele tuberculifer* spec. nov., holotype. 785, habitus, lateral aspect; 786, antenna; 787, apex of antenna; 788, wings; 789, head, dorsal aspect; 790, mesonotum, dorsal aspect; 791, inner hind claw; 792, detail of vein CU1b of fore wing; 793, head, frontal aspect; 794, 1st—3rd tergites, dorsal aspect; 795, detail of scutellum, lateral aspect. 785, 786, 788: scale-line, 1 ×; 787, 791: 5.0 ×; 789, 790, 792—795: 2.0 ×



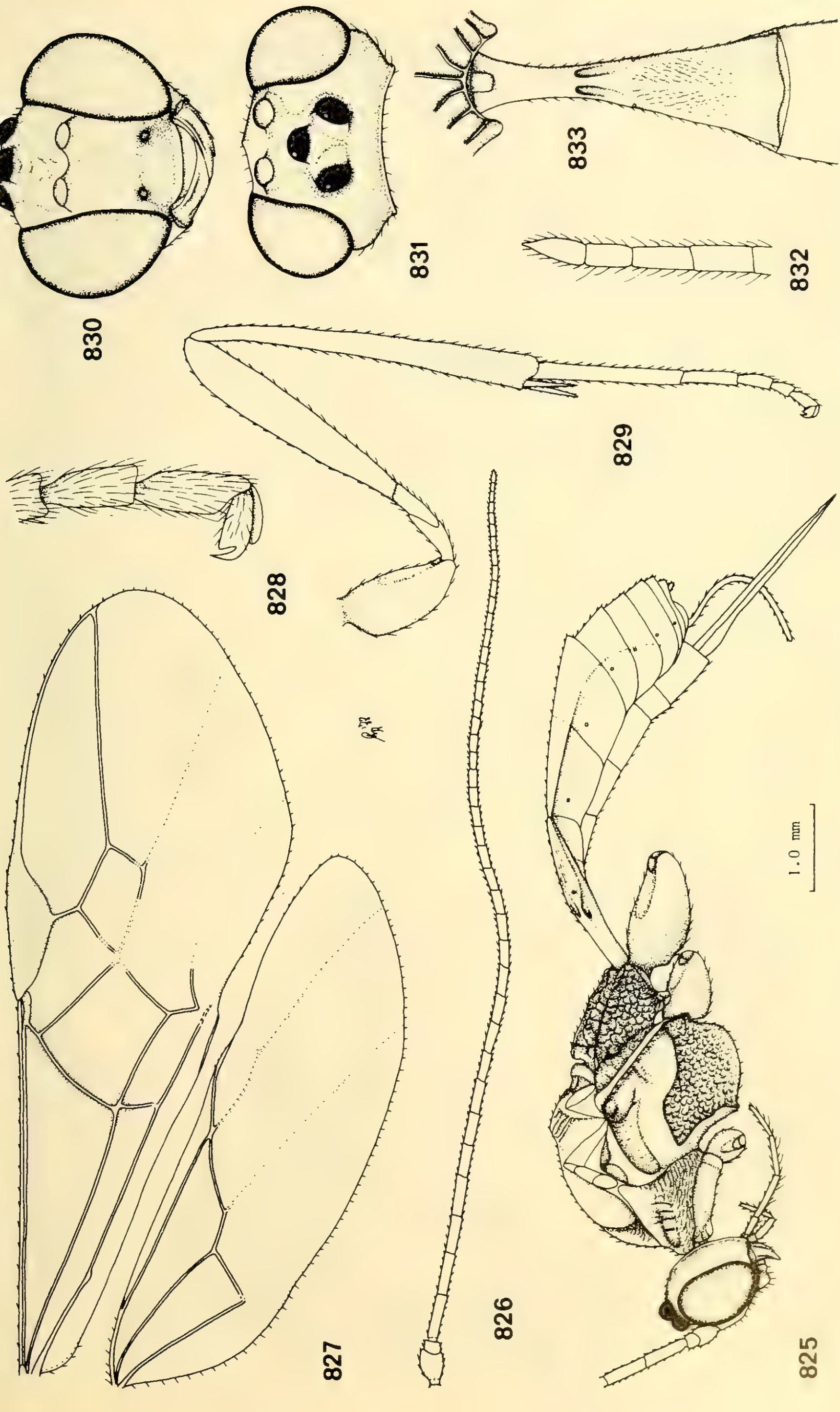
Figs. 796—805, *Zele niveitarsis* (Cresson), lectotype. 796, habitus, lateral aspect; 797, antenna; 798, wings; 799, apex of antenna; 800, palpi; 801, propodeum and 1st tergite, dorsal aspect; 802, head, dorsal aspect; 803, head, frontal aspect; 804, inner hind claw; 805, inner fore claw. 796—798: scale-line, 1 ×; 799, 804, 805: 5.0 ×; 800—803: 2.0 ×



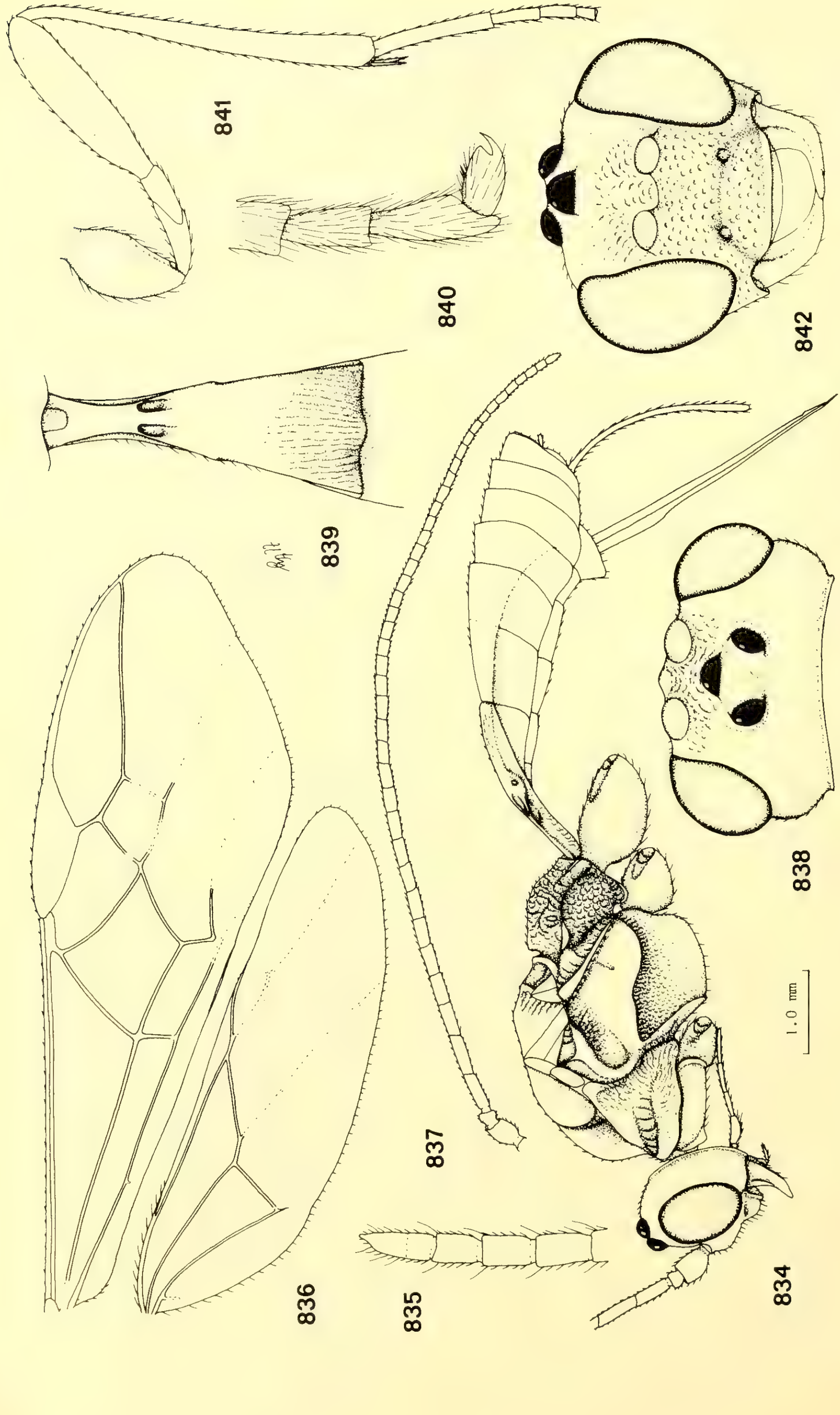
Figs. 806, 807, *Zele niveitarsis* (Cresson), lectotype. 806, hind leg; 807, mesonotum, dorsal aspect. Figs. 808, 809, *Zele crassifemur* (Muesebeck), holotype. 808, mesonotum, dorsal aspect; 809, palpi. Fig. 810, *Zele gracilis* spec. nov., holotype, hind leg. Fig. 811, *Zele picinervis* spec. nov., holotype, mesonotum, dorsal aspect. Fig. 812, *Zele tuberculifer* spec. nov., holotype, hind leg. Fig. 813, *Zele punctatus* spec. nov., holotype, inner hind claw. 806: 1.1 ×; 807—809, 811: 2.0 ×; 810, 812: scale-line, 1 ×; 813: 5.0 ×



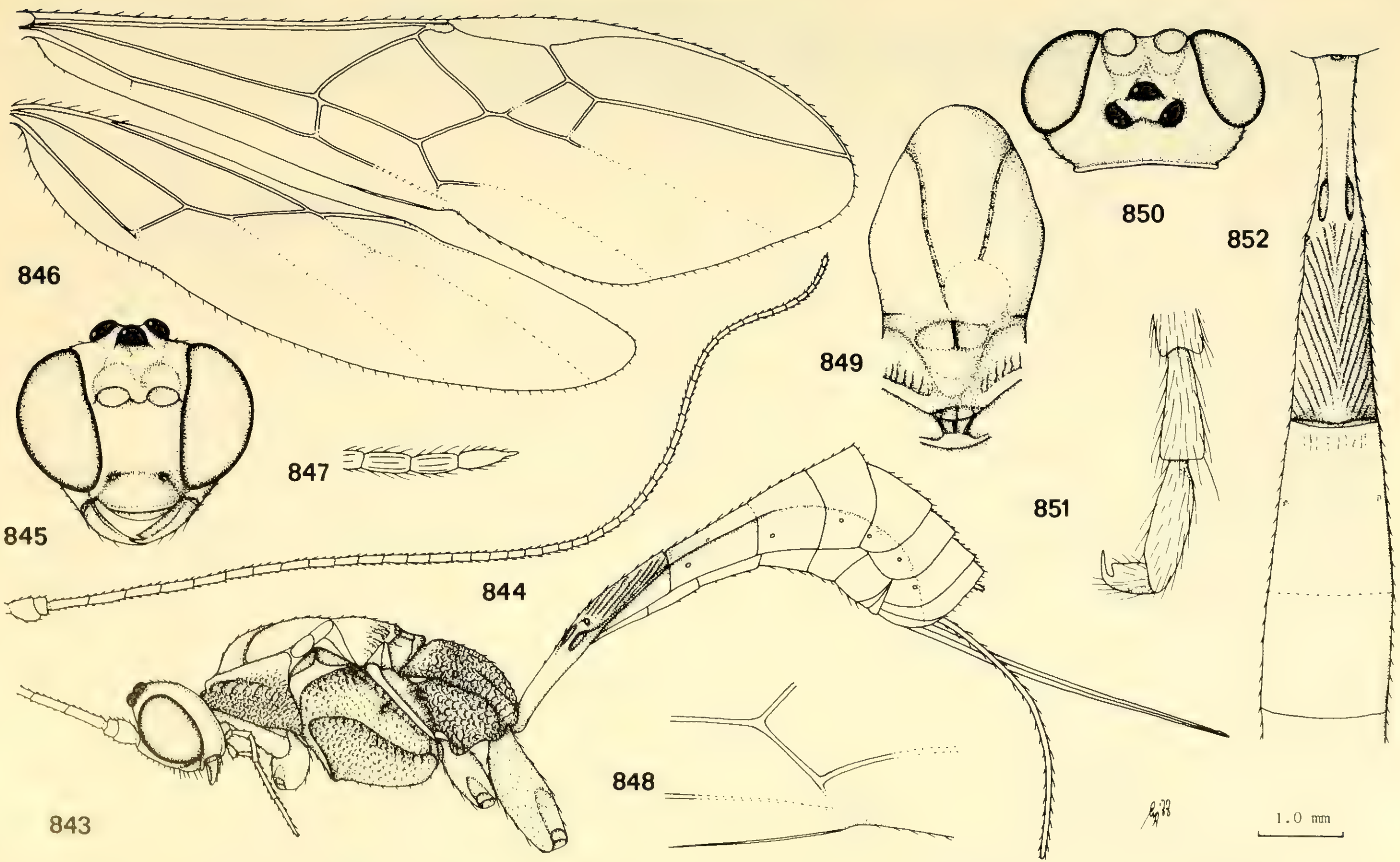
Figs. 814—824, *Zele chlorophthalmus* (Spinola), neotype. 814, wings; 815, habitus, lateral aspect; 816, head, frontal aspect; 817, head, dorsal aspect; 818, mesonotum, dorsal aspect; 819, apex of antenna; 820, antenna; 821, palpi; 822, hind leg; 823, inner hind claw; 824, propodeum and 1st tergite, dorsal aspect. 814, 815, 820, 822: scale-line, 1 ×; 816—818, 821, 824: 2.0 ×; 819, 823: 5.0 ×



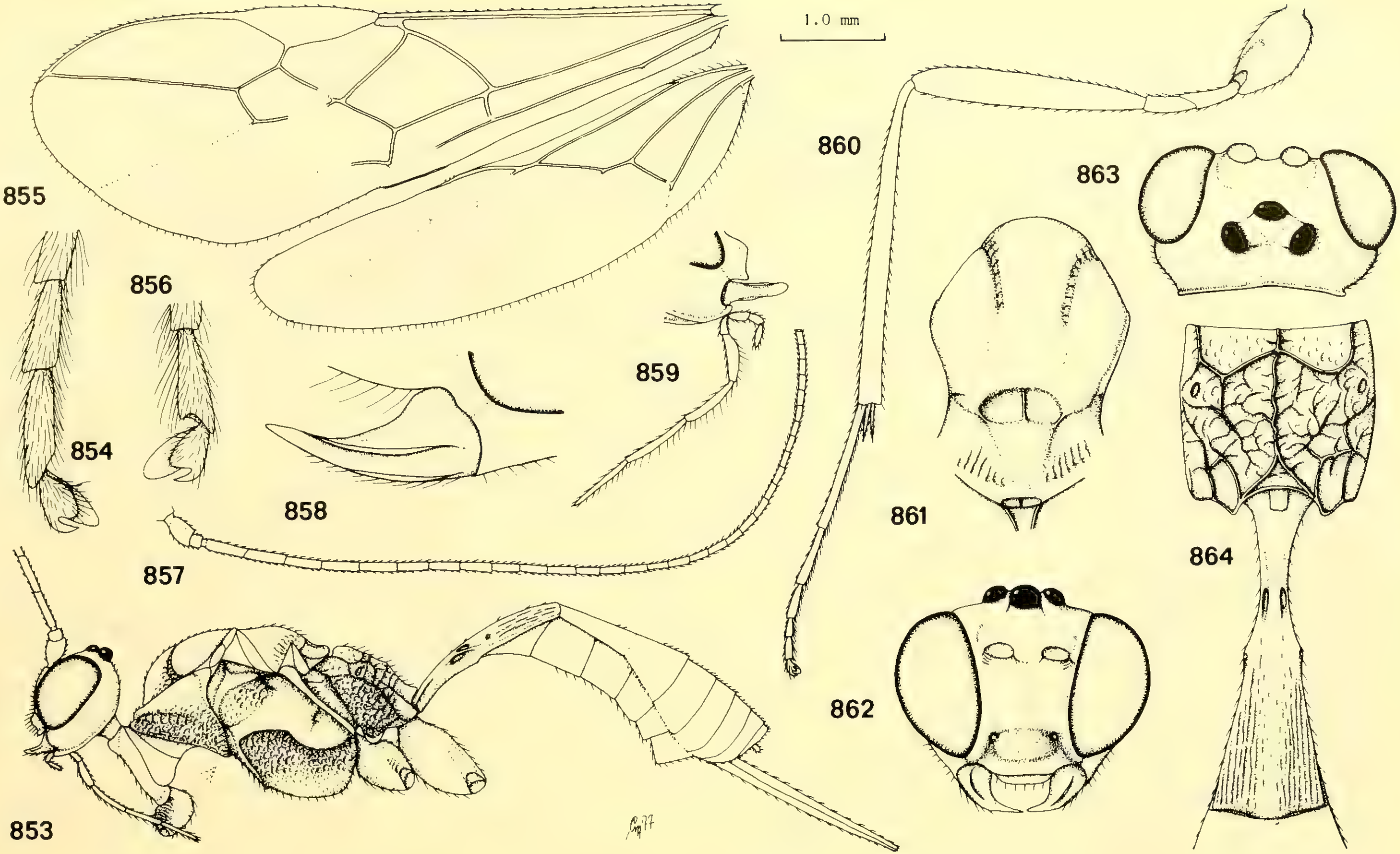
Figs. 825—833, *Zele picinervis* spec. nov., holotype. 825, habitus, lateral aspect; 826, antenna; 827, wings; 828, inner hind claw; 829, hind leg; 830, head, dorsal aspect; 831, head, frontal aspect; 832, apex of antenna; 833, 1st tergite, dorsal aspect. 825—827, 829: scale-line, 1 ×; 828, 832: 5.0 ×; 830, 831, 833: 2.0 ×



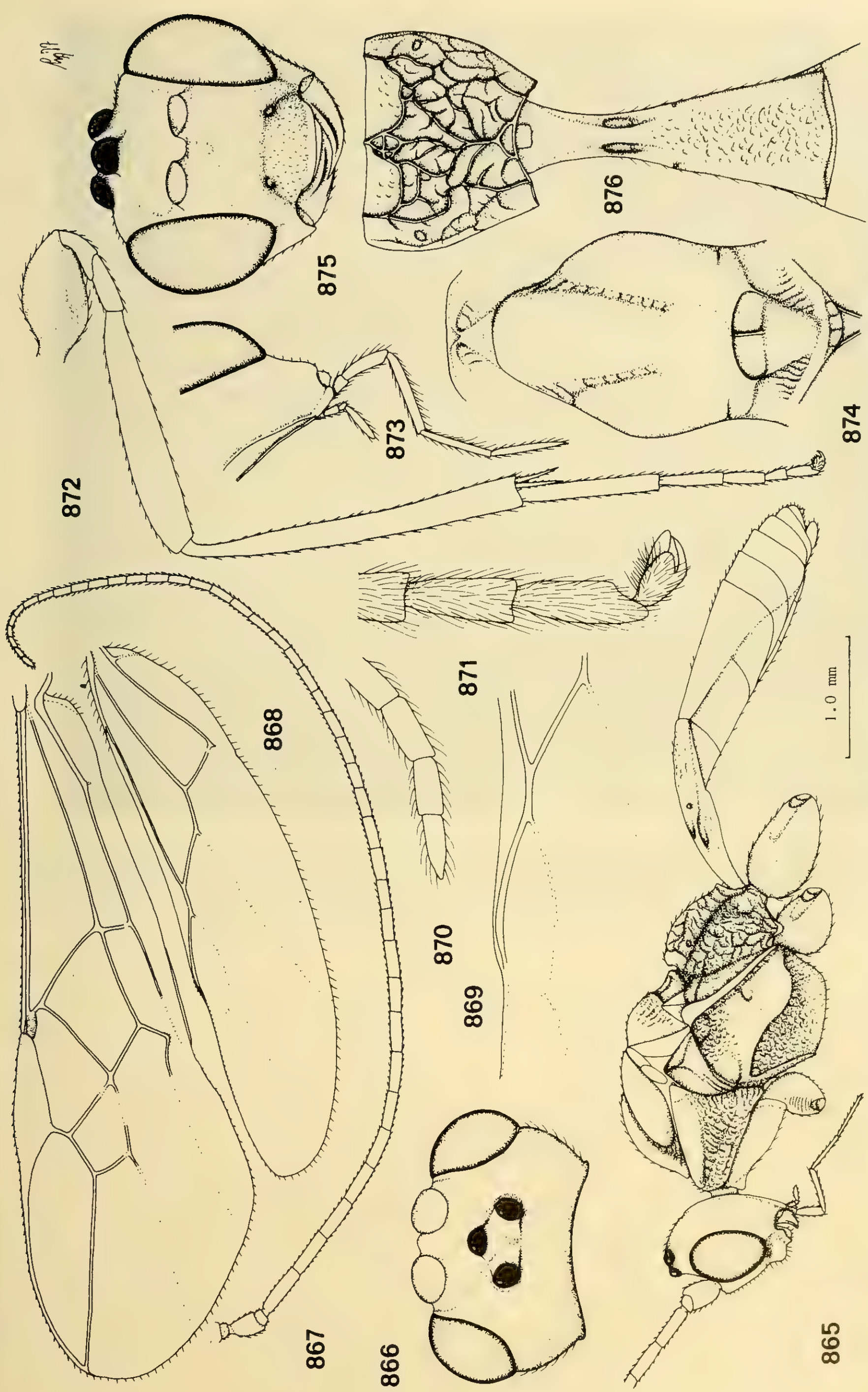
Figs. 834—842, *Zele crassifemur* (Muesebeck), holotype. 834, habitus, lateral aspect; 835, apex of antenna; 836, wings; 837, antenna; 838, head, dorsal aspect; 839, 1st tergite, dorsal aspect; 840, inner hind claw; 841, hind leg; 842, head, frontal aspect. 834, 836, 837, 841: scale-line, 1 ×; 835, 840: 5.0 ×; 838, 839, 842: 2.0 ×



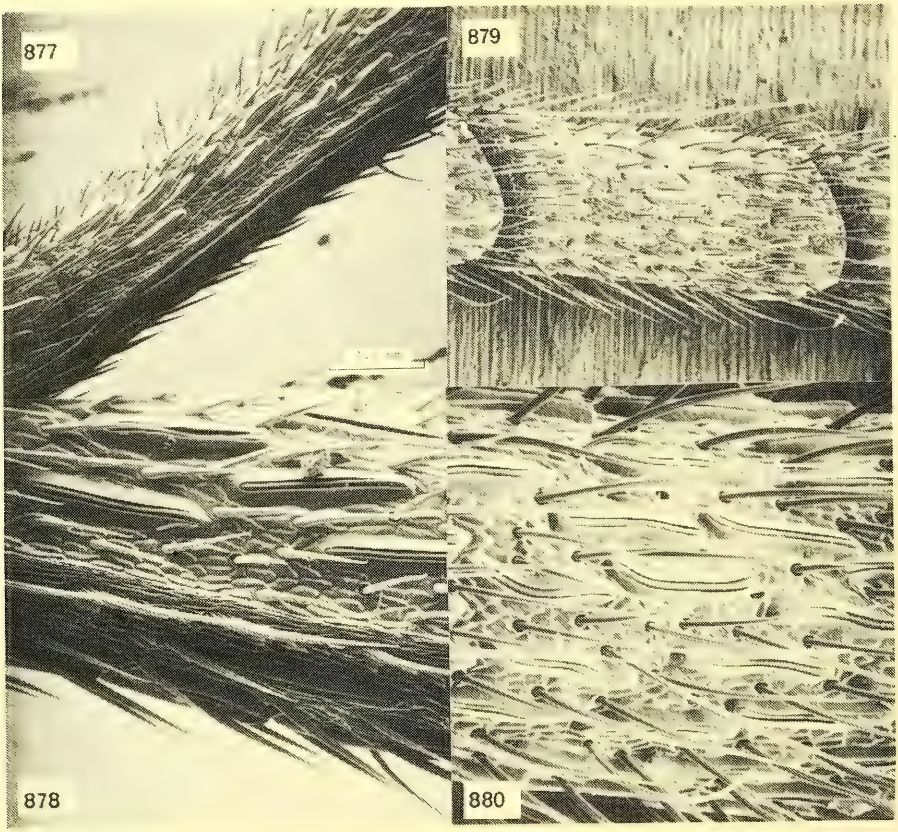
Figs. 843—852, *Zele gracilis* spec. nov., holotype. 843, habitus, lateral aspect; 844, antenna; 845, head, frontal aspect; 846, wings; 847, apex of antenna; 848, detail of vein CU1b of fore wing; 849, mesonotum, dorsal aspect; 850, head, dorsal aspect; 851, outer hind claw; 852, 1st—3rd tergites, dorsal aspect. 843, 844, 846: scale-line, 1 ×; 845, 849, 850, 852: 2.0 ×; 847, 851: 5.0 ×



Figs. 853—864, *Zele deceptor* (Wesmael), lectotype. 853, habitus, lateral aspect; 854, outer hind claw; 855, wings; 856, inner hind claw; 857, antenna; 858, detail of mandible, latero-ventral aspect; 859, palpi; 860, hind leg; 861, mesonotum, dorsal aspect; 862, head, frontal aspect; 863, head, dorsal aspect; 864, propodeum and 1st tergite, dorsal aspect. 853, 855, 857, 860: scale-line, 1 ×; 854, 856, 858: 5.0 ×; 859, 861—864: 2.0 ×



Figs. 865—876, *Zele pallitarsis* (Cresson), holotype. 865, habitus, lateral aspect; 866, head, dorsal aspect; 867, antenna; 868, wings; 869, detail of veins SC+R1 and SR of hind wing; 870, apex of antenna; 871, inner hind claw; 872, hind leg; 873, palpi; 874, mesonotum, dorsal aspect; 875, head, frontal aspect; 876, propodeum and 1st tergite, dorsal aspect. 865, 867, 868, 872: scale-line, 1 ×; 866, 869, 873—876: 2.0 ×; 870, 871: 5.0 ×



Figs. 877—880, inner aspect of 4th antennal segment. 877, 878, *Homolobus (Chartolobus) infumator* (Lyle), ♀, Netherlands, Nunspeet; 879, 880, *Homolobus (Apatia) truncator* (Say), ♀, U.S.A., Michigan, Ann Arbor. 877: 1.1 ×; 878, 880: 2.5 ×; 879: scale-line, 1 ×

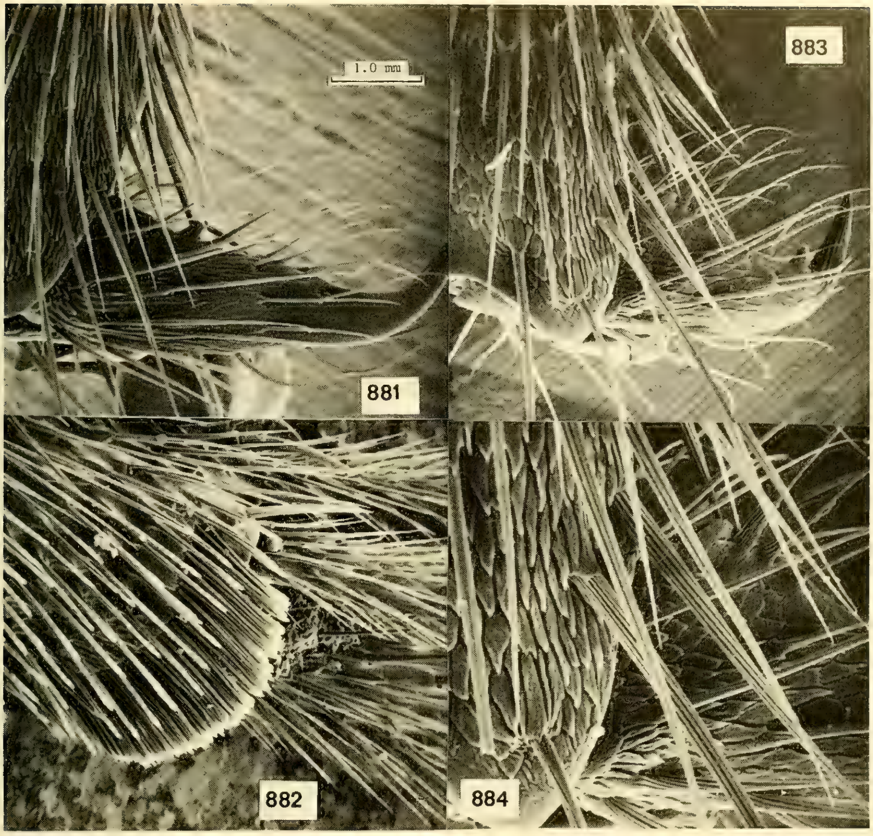
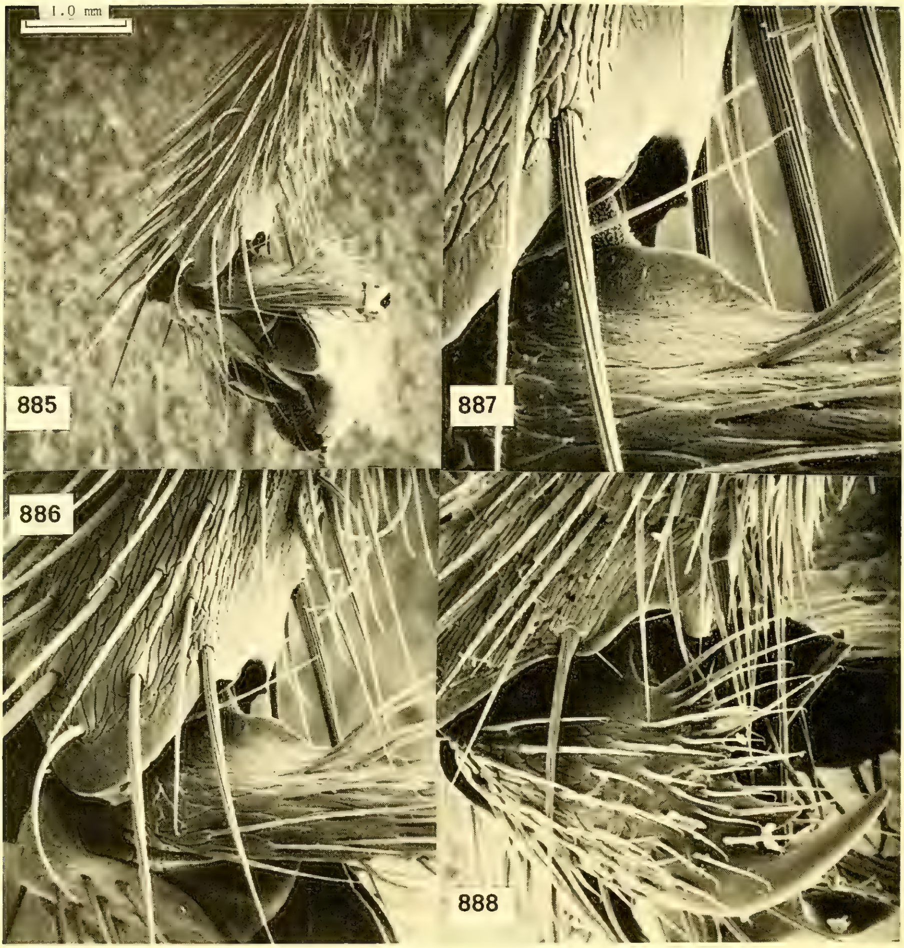
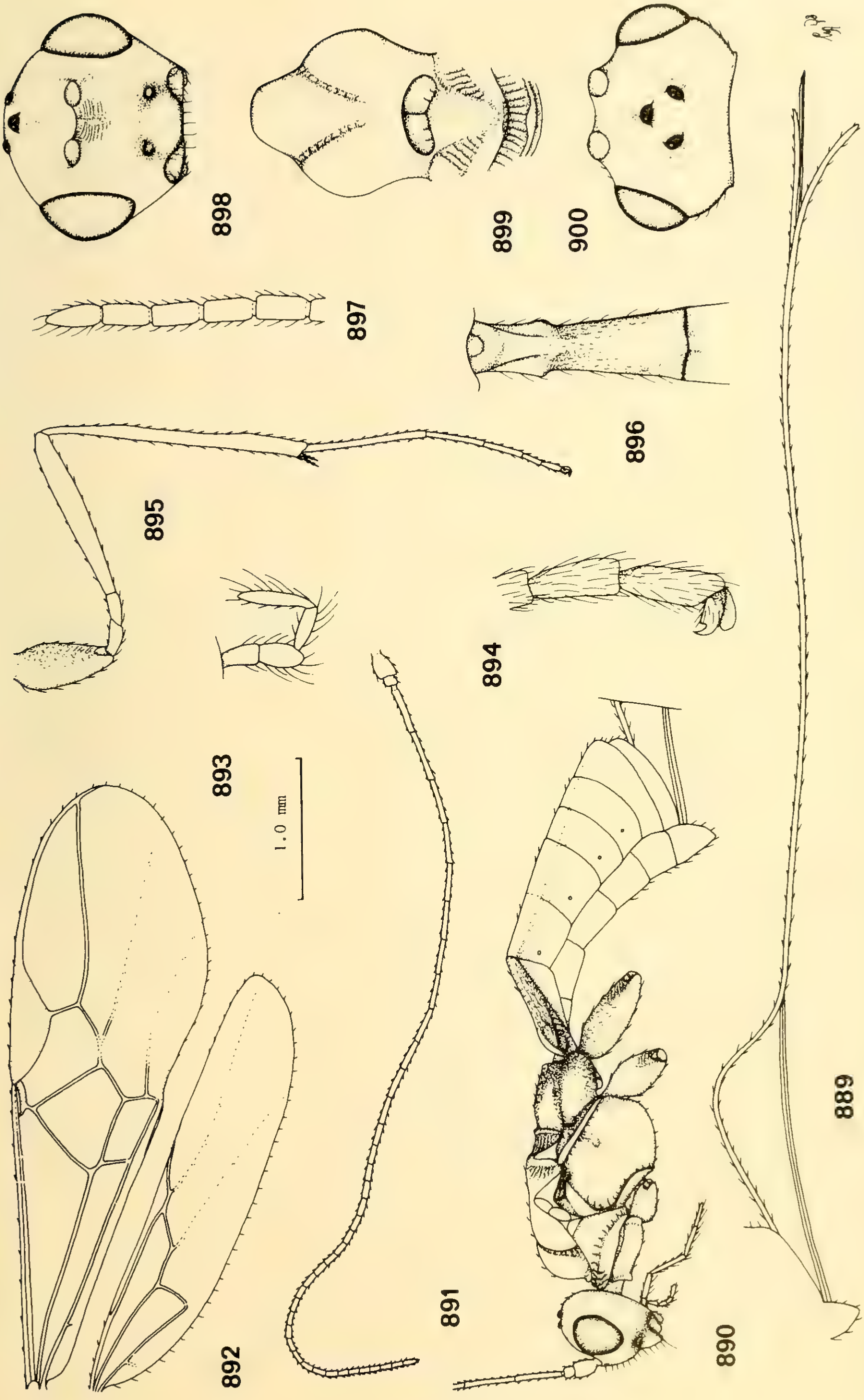


Fig. 881, *Homolobus (Apatia) truncator* (Say), ♀, U.S.A., Michigan, Ann Arbor, inner hind claw. Figs. 882—884, *Exasticolus fuscicornis* (Cameron), ♀, Brazil, Nova Teutonia. 882, inner aspect of apex of hind tibia; 883, 884: inner hind claw. 881: 2.1 ×; 882: scale-line, 1 ×; 883: 2.3 ×; 884: 4.6 ×



Figs. 885—888, inner hind claw of ♀. 885—887, *Homolobus (Homolobus) discolor* (Wesmael), Netherlands, Wijster. 888, *Homolobus (Chartolobus) infumator* (Lyle), Netherlands, Nunspeet. 885: scale-line, 1 ×; 886: 2.5 ×; 887: 5.0 ×; 888: 2.3 ×



Figs. 889—900, *Charmontia inopina* spec. nov., holotype. 889, ovipositor; 890, habitus, lateral aspect; 891, antenna; 892, wings; 893, labial palp; 894, outer hind claw; 895, hind leg; 896, 1st tergite, dorsal aspect; 897, apex of antenna; 898, head, frontal aspect; 899, mesonotum, dorsal aspect; 900, head, dorsal aspect. 889—892, 895: scale-line, 1 ×; 893, 894, 897: 5.0 ×; 896, 898—900: 2.0 ×

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